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THE NATURE-STUDY REVIEW

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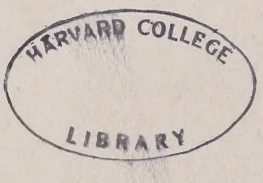

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THE
NATURE-STUDY REVIEW

DEVOTED PRIMARILY TO ALL SCIENTIFIC STUDIES OF NATURE IN ELEMENTARY SCHOOLS

VOL. 7 JANUARY, 1911 NO. 1

THREE TYPES OF CITY GARDENS

By ALICE RIGDEN, Principal Columbus School, Ottawa, Ill.

In March, the children of Columbus School, Ottawa, Ill., were organized into three clubs: The School Garden Club, Home Garden Club, and Young Farmers' Club.

The School Garden Club consisted of eighty members from Grades II to VIII inclusive. Any child who wished to, could join. There were no dues and no expense except for extra seed.

A FEW "YOUNG FARMERS" AND THE CHILDREN THEY HELP CARE FOR

A strip of land 200 feet by 45 feet was loaned to us. We cleaned it of the weeds of years, cut down the underbrush and then let the eighth-grade boys take charge. They spaded it and laid it off in beds 5 by 16 feet. The paths were two feet wide. The boys numbered the beds, from one to sixty, made tickets and

numbered them. A meeting was called and the "land drawing" took place. Each child had the right to exchange his ticket with anyone else if he liked another's location better than he did his own and could induce the other to exchange. Other meetings were held and talks given on the subject of the proper condition of soil, the time of planting different seeds and correct methods of planting. Seeds sent by the U. S. Government were given out. Other seeds were purchased as each child saw fit.

The children were given perfect freedom in the matter of planting. The bed was the child's. He could plant all vegetables or all flowers or part of one and part of the other. One of the most artistic beds was outlined and divided by tender green lettuce, and planted with radishes, onions, beets and flowers. Geese got in and devoured the lettuce. Many children supplied the home table with fresh vegetables until school was out; some worked until the hot weather and weeds affected them; others worked faithfully all summer and not only supplied their own table but had plenty of flowers and some pocket money,—best of all, better health.

The Home Garden Club was made up of children who had land at home which they could use. Many homes had gardens for the first time. One mother said: "Think of the gardens I might have had in fourteen years. The menfolks all laughed at Marie's ash-pile garden, but they enjoy the radishes and onions now." Marie is in the high school this year, but two immense bouquets of beautiful flowers sent us last week tell that she raised something besides radishes and onions. Yards that were mostly ashes and tin cans now show grass and flowers,—not very beautiful, but a beginning.

The Young Farmers' Club was made up of children who lived on what is known as "The Flats", where there were many lots thick with weeds. Some had not been planted for years. This was the most expensive venture. The children were not accustomed to any kind of work, neither were some of the parents. The season was very dry just when potatoes needed rain, and the crop was short, but it compared favorably with that of older gardeners and the potatoes were of good quality on most of the lots.

The cost was:

Rent of 8 lots at $1.00	$ 8.00
Plowing 8 lots at $1.00	8.00

24 bushels of seed at $.60	14.40
Help in digging, etc	4.00
Total	$34.40

Returns:

25 bu. of potatoes at $.90	$22.50
Radishes	1.00
Tomatoes	.90
Total	$24.40
Loss	10.00
	$34.40

THE MAGAZINE WRITER'S CONCEPTION OF NATURE-STUDY

"The only time when Bennie-Boy seemed to participate in affairs to the slightest degree was purely by accident, and then his participation was not cheerfully active, but was as tiresomely passive as all the rest had been—with his mates, he listened to a 'nature talk.' It consisted chiefly in harrowing disclosures about the private life of a cow—how she reared up a beautiful bossy-infant for herself and manufactured milk for it, chewing early and late, only to have both infant and commissary thieved from her (though—it was amelioratingly explained—the cow had not real maternal love, only instinct, which was the very identical same thing except that it wasn't)—how she was tortured by flies, ofttimes by thirst—and how finally she exchanged her integral existence upon the grassy verdure of sylvan fields for a sectional distribution upon the hooks of a meat market.

"The nature talk over, the others had to draw quadrilateral cows upon their slates, but Bennie-Boy, not having this article, having—as the song says—'no place, no part, no dwelling more by sea or shore,' very sensibly went to sleep and let society giddy whirl without him, as it fully intended to do, and was competent of doing."—From "His Place in the Line," by Marion Hill, in American Magazine, July, 1910.

COURSE IN NATURE-STUDY, EUGENE FIELD SCHOOL, ST. LOUIS, MO.

(As Outlined By W. J. STEVENS, Principal)

Underlying Principles

1. Activity is the result of the action of forces as truly as that the motion of bodies as explained in physics is the result of forces.
2. The forces that produce social activity are desires.
3. The desires that nature-study seeks to develop are:
   a. Desire to acquire facts
   b. Desire to discover truths from these facts
   c. Desire to convey knowledge of facts and truths

Aims

1. Activity of the individual pleasurable to himself and valuable to society, secured by:
   a. Accumulation of facts regarding the objects and processes of nature, and adapted to the experiences of the children
   b. Assistance, in a very limited way, in the discovery of truths from a comparison of facts
   c. The exercise of the desire to convey facts and truths to others

Subjects Treated: Health lessons (from books—method not that of nature-study); plants; animals; inorganic nature.

Instruments: Text-books on hygiene; the school garden; vivaria; aquaria; the school museum; special skill and interest of individual pupils.

Correlations: Geography; language; drawing; United States history; home improvement.

The major part of the work in nature-study will center about the school garden. This will be laid out so that there will be a bed for each room in the school, to be regarded as its individual property. There will be a path around each bed wide enough to accommodate a considerable number of pupils as they stand about the bed when a lesson is being given.

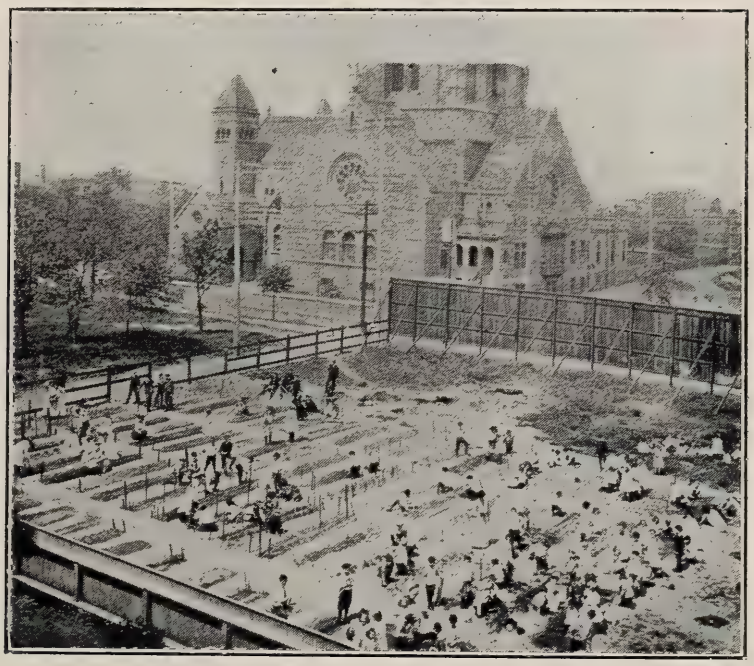
Each room will decide what shall be planted in its garden. It is recommended that annuals mentioned in the readers or in geography work for the year be cultivated so that pupils may become familiar with these plants.

In the three highest grades, it may be found interesting to learn as much as possible about the domestication of the food and fiber plants that are grown.

When the weather is particularly favorable or particularly unfavorable to the garden work or the growth of plants, the occasion for the study of the weather presents itself. In the upper grades the average daily temperature may be taken, using at least three observations and comparing these observations with the local weather report for that day.

Problems in soil, problems with injurious insects, problems with plant disease, should receive attention as they arise.

The principal will be under special obligations to the teachers if they will write down any of the questions that the pupils ask of their own accord. In this way he will be better able to form an idea of the content of their minds at different ages and better able to plan a course for the future. Do not discourage the pupils from asking questions, even if we cannot answer many of them. None of us knows much about the things we are studying. We are learners together. It is far better to say "I do not know," than to give an incorrect answer. The principal will be glad to help answer any questions.



SCHOOL GARDEN OF EUGENE FIELD SCHOOL, ST. LOUIS, MO.

The fiber bearing plants should be studied while growing and the study should go on from this to their preparation for spinning and weaving. Individual pupils should be encouraged

to learn how to prepare the fibers, how to spin and how to weave. Good work done in this direction should entitle the pupil to credit in his geography work as well as in nature-study.

The processes through which the food plants must go before they are ready for the table are subjects about which the pupils should try to find information.

The growing plants in each of the beds should be neatly labelled so that the pupils from other rooms may learn their names.

Along one side of the garden will be a strip of ground that will be regarded as the property of all the rooms. In this will be found plants that live from year to year. Each plant will have a distinct label. Pupils should be encouraged to learn to recognize all these plants and name them. Any of them may be made the subject of more intensive study when the teacher thinks her pupils are able to do this kind of study profitably.

The garden will provide for the study of more than one hundred plants. What the pupils do in the garden, what they learn of plants, may be made the subject of compositions.

A partial list of the plants is here appended. This list is subject to modification as the exigencies of the case may demand.

I. Trees
  1. Ornamental and shade
    a. Maple
    b. Elm
    c. Poplar
    d. Sycamore
    e. Mulberry
  2. Food producing
    a. Apple
    b. Peach
    c. Pear
    d. Plum

II. Shrubs and bushes
  1. Ornamental
    a. Lilac
    b. Spirea
    c. Weigelia
    d. Althaea
  2. Food producing
    a. Currant
    b. Gooseberry
    c. Blackberry
    d. Raspberry

III. Woody vines
  1. Ornamental
    a. Virginia creeper
    b. Boston ivy
    c. Trumpet vine
  2. Food producing
    a. Grape

IV. Perennial herbs
  1. Ornamental
    a. Hollyhock
    b. Aster
    c. Chrysanthemum
    d. Iris

e. Native flowering perennials gathered from woods and fields
2. Food producing
a. Asparagus
b. Hop
c. Strawberry
V. Plants from bulbs
1. Crocus
2. Hyacinth
3. Lily
4. Jonquil
VI. Annuals
1. Ornamental
a. Selections to be made by pupils and teacher
2. Fiber producing
a. Cotton
b. Flax
c. Hemp
3. Food producing
a. Grains
(1) Wheat
(2) Oats
(3) Rye
(4) Barley
(5) Corn
(6) Rice
(7) Kaffir corn
(8) Sorghum
(9) Millet
b. Legumes
(1) Peas
(2) Beans
(3) Peanuts
c. Root vegetables
(1) Beets
(2) Carrots
(3) Salsify
(4) Radishes
(5) Turnips
(6) Onions
d. Salads
(1) Lettuce
(2) Mustard
(3) Spinach
(4) Cress
(5) Chicory
(6) Celery
(7) Cucumber
e. Tubers
(1) Potato
(2) Sweet potato
(3) Artichoke
f. Miscellaneous
(1) Tomato
(2) Egg plant
(3) Gumbo
VII. Narcotics
1. Tobacco
2. Jamestown weed
3. Poppy
VIII. Fodder or stover plants
1. Clovers
a. Red clover
b. White clover
c. Alfalfa
d. Sweet scented clover
2. Grasses
a. Timothy
b. Blue grass
c. Orchard grass
d. Crab grass
IX. Weeds

The names of the weeds that grow in the garden are to be learned. Some of the weeds are to be permitted to flower and fruit so that they may be recognized at different stages of their growth.

The animals that are noticed in connection with the garden work may be studied when found. Endeavor to discover in what respect they aid or hinder the success of the garden. Some of the animals that are likely to claim attention are the earthworms, grubs of various kinds, cutworms, beetles, bees, ants, leaf-eating larvae, moths, aphids.

In addition to the study of these animals, teachers who have vivaria should continue the excellent work they have been doing with the habits and life histories of grasshoppers, toads and moths.

Those having aquaria have a never-ending source of interest in the study of fishes, toad spawn, frog spawn, and tadpoles.

The study of the silk worm should be continued as heretofore. It furnishes a type study that is invaluable. In the upper grades, children should be encouraged to learn to unwind the silk from the cocoons.

Health lessons should be given during the winter months when work cannot be done out of doors.

To the teachers we will say: "Do not be overwhelmed with the quantity of matter that has been written about nature-study, nor by the courses of study that suggest a multitude of subjects." To attempt to teach all that is laid out in courses in nature-study would be to insure failure in the teaching.

If the garden belonging to each room is well managed, if there is earnest study of the problems that arise in connection with the garden work, if the few questions that arise in the minds of the pupils are intelligently answered and they learn slowly to ask other questions, the result will be more satisfactory than to follow any elaborate course of study.

The teacher will be wise if she teaches the subjects she knows best and in which she is most interested. She should be progressive, however,—should not teach the same subject twice in the same way. She should each time teach it better because she has learned more about it.

Membership in the American Nature-Study Society will be a great help to each teacher and she will receive the Nature-Study Review, besides having the privilege of making at last four field trips during the year with the St. Louis Branch of this Society.

Mr. Dewey's statement of a teacher's relation to the course of study applies with full force to nature-study. He says: "What gets to the child depends upon what is in the consciousness of the teacher, and upon the way it is in her mind."

A RIVER AUTOBIOGRAPHY

By EUGENIA PORTER, Peabody School, St. Louis

Formed by small streams and fed by small rills
That find their way down the slopes of the hills,
I begin my work of erosion.

My profile is steep, but surely though slowly
I work on the hills, till the lofty are lowly,
And broaden and deepen my valleys.

Moving more slowly but greater in strength,
Embracing my brothers that come in my length,
I work my way down to the ocean.

Becoming mature, I do mighty deeds,
Bearing great loads and filling up meads,
And gradually reaching base level.

In broad sweeping lines a delta I form
And indented coast, the which I adorn
With bountiful waste, called detritus.

In long ages hence, my labor well done
Enjoying my rest and embraced by the sun,
I will leave my dry bed to explorers.

A CAMPAIGN AGAINST FLIES IN A TOWN OF 6,000

[EDITOR'S NOTE: Following our announcement that papers of interest to parents will appear in the Review throughout the year, this account is given in the hope that it will suggest to teachers and school patrons certain lines of practical work in nature-study which will serve to bring home and school into closer relation and aid in arousing to action soldiers of peace, both young and old. The writer's name is withheld by request.]

This town of western Illinois is, perhaps, so far as cleanliness is concerned, neither better nor worse than the average small place. Flies always have been very conspicuous around the grocery stores and restaurants from June till October, swarming about fruits and meats which were most inadequately protected. Members of the Woman's Civic League had often discussed the matter, and from the time of their organization (March, 1908) talked of a campaign against flies, but had no idea of what would be the most effective way to go about it. They had had a few little extracts from magazine articles published in the local papers from time to time. This summer a member reported that they had been remonstrating with their grocers and butchers, and almost invariably had been assured that "flies don't hurt anything"; "flies aren't bad now—they are usually lots worse", etc. The women became more and more aware of the fact that the great majority of people still look upon the fly as merely a *harmless nuisance,* and realized that nothing short of a most vigorous educational campaign would do any good.

Finally the American Review of Reviews for July, 1910, came out with an excellent article on the dangers of flies, with facsimilies of two posters. This furnished the somewhat definite and tangible suggestions they had been looking for. Consequently at the July meeting of the League (July 1), on the recommendation of the Committee on Public Health and Utilities (which had been created two months before) a sum not to exceed fifteen dollars was appropriated to be used at the discretion of that committee to start the campaign against flies. The committee immediately decided to do three things.

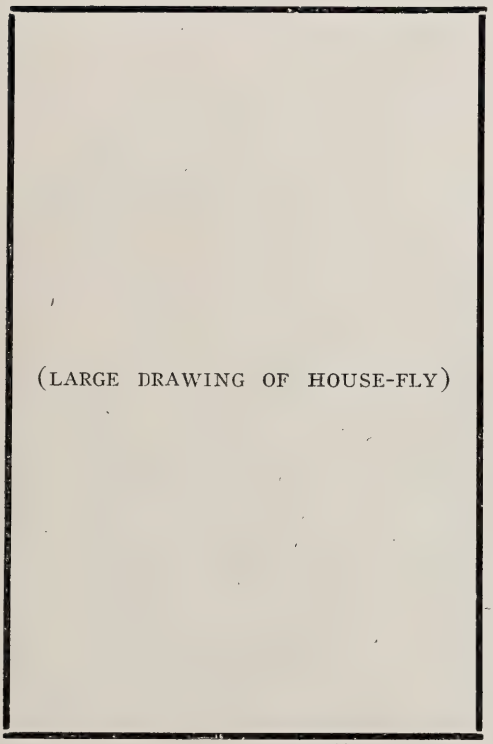
1. To publish conspicuously a series of eight or ten short articles in the local papers.
2. To have enough large posters made to put one in each place of business in town.
3. To place in each home a hand bill with essentially the same reading matter as that on the posters.

Copy for the posters and two of the newspaper articles was then submitted to the physicians on the board of health, who gave their heartiest approbation, though one said the newspaper articles would be most effective; another, the bills distributed to the houses. Four electroplates of a much enlarged cut of a fly were ordered. These measured about 2¼ x 4 inches, and were used on the posters, the handbills, and at the head of all the articles in the papers to attract attention.

Two to four articles a week then appeared in the two daily papers, until about ten had been printed. Only one or two would have been printed weekly had the work been begun as early as it should have been. The articles were published in the three local weekly papers, and were sent to the five other weekly papers in the county, some of which published them.

The following is a sample of these articles:

NO FLY HAS YET BEEN FOUND



COMMON HOUSE-FLY OR TYPHOID FLY

that will wipe his feet before he crawls on your food. Because this is so, because we know the history of the fly—from the swill pail to your table—only the greatest care may save you from disease and possibly death.

The extermination of the fly is in the interest of humanity; for while we call the common fly the typhoid fly, it may, with truth, be called the tuberculosis fly. If in its wanderings it has access to those ill with tuberculosis, or to the sputem of a consumptive, it will carry the tuberculosis germ to the food we eat or the water we drink.

NO FLY IS CLEAN

Besides carrying typhoid and tuberculosis, it is the cause of a whole host of summer diseases, and many, many children die from eating food over which one or many flies have crawled. According to statistics, out of 100 cases of children's deaths, 37 are caused by intestinal diseases largely the result of flies.

Don't give the baby milk when even one fly has had access to it, or has crawled over the cup from which baby drinks. Don't let baby eat anything that a fly has touched. Flies are more deadly than snakes.

NO FILTH, NO FLY.

Ten thousand handbills, adapted by the committee from the posters in the Review of Reviews, were printed in large type on ordinary newspaper stock 6 x 9 inches.

The committee themselves distributed these in over half the town, and employed a man to take the principal streets. This experience, however, confirmed the old adage about doing a thing yourself if you want it done well. A good many of the bills were thrown into vehicles on Saturday and on circus day.

Three hundred posters 11 x 14 inches with the same reading matter, but different heading, were printed in very large type on three-ply board. The committee distributed these, putting one in each place of business, in a window or other conspicuous place, with the request that they be left until the close of the season. Many complied with this request; all received the committee graciously, and seemed anxious to encourage any measures calculated to abate the fly nuisance.

Expenses were as follows:

Four electroplates of cut of fly.....	$2.25
3000 handbills 6 x 9 (1st 1000, $3.00)..	4.70
300 posters 11 x 14 (1st 100, $2.50).....	4.00

Results were soon noticeable, though conditions remained bad enough. Foods and meats were kept more carefully screened, discussion was provoked on all hands, and people insisted they had learned much. Up to the present time (December 1) there have been fewer cases of typhoid than usual at this time of year.

The work will be continued next season, and probably yet another will be necessary. Next summer a series of articles with a new cut will be published in the local papers, beginning early in the season. Then, if it is not too expensive, small electroplates of a fly, about twice its length, will be used with a line or two of type; as, "Kill it or it will kill you", "The dirtiest and most dangerous animal in the world", "Kill it and reduce typhoid cases by half", "It kills more infants than any other thing", etc. If the plates are too expensive, large type with a heavy line above and below will suffice. The plates are merely to attract attention.

The committee is planning to work with the Clean-up Day Committee next spring, and have large posters in black and white and in colors made in the schools. Last spring the pupils of the public schools made many original and clever posters for clean-up day, which the business men were glad to display in their win-

dows. Next spring the idea running through most of them will be, *Clean up the town to prevent flies.* A prize may be offered for the poster setting forth most effectively the dangers of flies.

This committee also placed a sanitary drinking fountain in one of the four ward schools at a cost of twenty-five dollars. The school board immediately decided to install them in the other wards next summer. The Civic League expects to be financially able to place one on the square next spring. A series of articles on tuberculosis and agitation for milk inspection are undertakings that the committee hopes to begin on this winter.

Perhaps, for the benefit of those who wish to organize for this kind of work, something should be said concerning the Woman's Civic League, which was organized by representatives from the various literary clubs in March, 1908. The object is to cooperate with the officials to have a clean, healthful, and beautiful city, and to educate the rising generation to do the same. Any one interested in the work may become a member by paying the annual fee of one dollar. The membership consists of about seventy-five of the leading women of the town. The working members, of whom there are twenty-five to thirty, are organized into the following committees:

Streets and Alleys.—This is the Clean-up Day Committee also.

Membership and Finance.

Public Utilities.

Parks, which has done much toward influencing owners of property abutting on the park to keep their premises tidy.

Preservation of Natural Beauty, which has offered prizes for the best children's gardens, and lawns showing most improvement.

Railroad, which has greatly improved conditions around the station, and made a small railroad park.

Humane, which had four officers (without pay) appointed by the city council for the prevention of cruelty to animals. This was not wholly satisfactory, so the committee enlisted the cooperation of a number of leading men, and organized a humane society, embracing the whole county and affiliated with the Illinois Human Society, and changed its name to the *Philanthropic,* which annually makes several layettes at a cost of three dollars each for the infants of those who are too poor to provide them; maintains a representative on the city charities board, which it

helped to organize last February; and has a number of workers (visitors) at the disposal of that board.

Experience has shown that it is better not to have too many committees at first, but to add them as needed. Though there has been some prejudice against the League on the part of those who feel that mixing in civic matters does not properly belong to the sphere of woman, business men generally have been very kind and apparently grateful to the women for helping with matters they have been too busy to undertake.

FROM SCHOOL TO HOME

By FRED L. CHARLES, University of Illinois

Many statistical studies have been made, for psychological purposes and otherwise, of children's activities, interests and ambitions as indicated by the subjects themselves in writing. Unversed in introspection and susceptible as they are to suggestion, under the eminently artificial conditions of the investigation the most interesting result, psychologically, of some researches is the evident satisfaction of the experimenter with his effort. At the risk of being thus classified the following study is reported.

The school in question was located in the outskirts of a city of 7,500 inhabitants. Anticipating the observance of an Autumn Arbor Day—and before any announcement or intimation on the subject had been given—the writer appeared before the eighth grade class and requested that each pupil should answer on a sheet of paper two questions which he would put to them. Our purpose, it may be remarked in passing, was twofold; to induce interest in the Arbor Day project without argument, and to place the responsibility, if possible, for the child's inertia in creative nature-study activities of an aesthetic nature. The following questions were asked orally:

(1) What have you ever done, personally, toward the permanent improvement of your lawn or home grounds, such as setting out trees or shrubs or laying out flower beds—exclusive of garden work?

(2) If you have done anything of this character, state how you happened to undertake it; if you have done nothing, state why.

It is believed that the data obtained express the situation with a fair degree of accuracy.

There were 30 in the school, 16 girls and 14 boys; 3 girls had planted, 13 had not; 6 boys had planted, 8 had not. Two girls planted because they liked to and liked to see the plants; one to help her mother. Nine girls did not plant for the reason that the father or some one else did the planting, one adding that she did not know how and another that she did not care to. One girl did not plant because she never had anything to plant; one because she did not like to and was not asked to; one because she didn't care to; and one because she never thought of it. Of the boys, three had not planted for the reason that their father or some one else did the planting; two because they did not have to; one because all the necessary planting had been done when they moved to the place; one because he lived upstairs; and one because he did not want to. One boy had planted to help his father; one because the farm was large and he thought it needed "a swell front"; one because he saw a tree that another boy had planted; one because he wanted to see if a tree would grow when transplanted; one because they had some trees to plant and he didn't know what else to do; and one had planted flowers, but did not state the occasion of his doing so.

This was a prosperous, growing community and many of the homes were new. Here were 30 intelligent boys and girls about to enter high school, 9 of whom had contributed to the improvement of the home grounds and to civic pride, while 21 had done nothing. Of these 21, 12 specifically state that this is a matter in which they are not involved, and this interpretation may be given in practically every case.

There is no occasion to adorn this tale. These children were not strangers to the school garden nor to an annual exercise in tree planting. Surely the schools have their shortcomings, but if the gap between school and home is to be closed—the gap into which so much that is precious goes down by default—the parent must share the burden of educating and not allow the child to be a passive witness in what should be a home democracy of work.

NEST BOXES FOR WOODPECKERS

By FRANK C. PELLETT, Atlantic, Iowa

Strange, is it not, that among all the articles that have been written about attracting birds, no one has, as yet, told us how to make a box for woodpeckers? It has not been from lack of interest, however, for the problem of furnishing artificial homes for woodpeckers has engaged the attention of bird lovers for some time. Some naturalists have said that, inasmuch as woodpeckers had not been induced to occupy boxes, it was out of the question to fill their requirements. Others have said that by devising expensive machinery that would bore a hole in the natural wood, similar to that made by the birds, themselves, they could be induced to occupy it.

Artificial homes for birds have been a matter of experiment with me for several years. While a number of species not commonly occupying boxes, have reared their families with me, it is

WOODPECKERS IN READY-MADE HOME

FIRST WOODPECKER TO REAR FAMILY IN A BOX FEEDING THE YOUNG

A QUARTETTE FROM A FAMILY OF SEVEN

my purpose to confine myself to a description of boxes for woodpeckers. These boxes have been so successful, that I feel safe in saying that woodpeckers can be attracted to boxes as easily as any other birds, even bluebirds, if we comply with a few simple requirements.

My home is in a small grove of native woods, some distance

in the country. Here I have had ample opportunity to study the birds, under natural conditions. Three species of woodpeckers have reared their young in the cavities excavated by themselves in the trees near at hand. They have occupied our boxes, not because of lack of suitable nesting sites, but because the boxes supplied all their requirements equally well, and saved them the labor of boring the hole in a tree.

Golden-winged woodpeckers have, at various times, made a number of holes in the cornice of our house, but have not attempted to occupy them. Such incidents must be familiar to every reader. This fact convinced me that woodpeckers would readily occupy boxes if they could. The trouble was, of course, with the interior of the box. If the birds were to lay their eggs on the bottom, there was nothing to serve the purpose of a nest. In making their excavation in the decayed wood of a linden tree near by, they left the bottom rounded somewhat like the bottom of a cup, and allowed a lot of chips to remain, instead of bringing in foreign material as do other birds.

In making our boxes we had two things in mind: that the cavity must be deep, and that there must be something to serve the purpose of a nest. The result was such boxes as shown in the accompanying pictures. Old lumber was used, as I felt doubtful as to whether these birds would take kindly to painted houses. With four boards eight inches wide, and two and a half feet long, it is easy to supply the requirements of a golden winged woodpecker. Boards six inches wide will make a box large enough for the smaller species. The opening is made near the top of the upright box, just large enough to allow the birds to enter easily. To supply the nest, ground cork, such as grapes are packed in, secured from a fruit store, is placed in the bottom of the box to a depth of about six inches. Of course, it is not necessary to put in so much. The space between the opening and the cork should be at least twelve inches, and I am inclined to regard fifteen inches as better, especially for golden wings (flickers).

The birds take readily to these boxes, if placed in a suitable situation, which with us is usually at the top of a pole fifteen feet or more above ground, or nailed well up to the side of a tree. Although woodpeckers often make for themselves homes within a few feet of the ground, we have not succeeded in inducing them to occupy boxes lower than about fifteen feet. The eggs are placed on the cork, which supplies nearly the same conditions as

are found in the cavities that the birds excavate for themselves. I have seen a lively contention between a red-headed woodpecker and a golden winged one, as to who should possess one of these boxes. The contest was renewed on several occasions before the redhead retired from the field. There are other birds beside woodpeckers that supply no nesting material. They, I feel sure, will find these boxes equally satisfactory. In fact, a pair of sparrow hawks occupied one in our front yard and successfully reared their family the past summer. Neither woodpeckers or sparrow hawks, so far as I can learn, had ever before been known to occupy artificial nesting sites.

These boxes have been so readily received by the birds in our grove, that I feel the greatest confidence in recommending them to the public. I hope that they will be tried by bird lovers generally over a wide stretch of country, and under various conditions, next season, and that the results may be reported in "Nature-Study Review."

In closing, a word of suggestion. Where the ground cork is not available, try sawdust. It would seem that there is no reason why it should not be as good. The nesting material is the essential thing, although the depth of cavity, and the situation of the box will have much to do with the success of the experiment. Although we have used only weathered lumber, making boxes look as much like dead wood as possible, it migght be well to try painted ones also. Possibly the birds may have no objection to up-to-date houses with paint and furbelows.

NATURE CALENDARS

By CHESTER A. MATHEWSON, Brooklyn Training School for Teachers

In large cities the problem of getting pupils to really *see* Nature is ever present and exceedingly important. Many devices are made use of, to develop and stimulate a live interest in natural objects, but the one which is possibly most effective where crowded populations are concerned is the nature calendar.

In the Brooklyn Training School for Teachers, at the first favorable opportunity after the opening of a term the subject of nature calendars is discussed, and ways and means suggested. The various topics or processes that one might have in mind while going about the city, or when on a visit in the suburbs or in the country, are listed on the board, and comments on the best methods of observing are made.

First of all we decide to make a general class calendar, embodying the composite results of the observations of the members of the class. Each one is allowed to write down only such observations as she has personally made. In my own classes I have found it worth while to spend about fifteen minutes at a stated time each week in discussing the observations as they are reported verbally. I endeavor to have each member feel definitely responsible for, and pride in, the class calendar. Perfunctory written records are guarded against by means of these oral reports. If one phase of nature-study observations is found to be receiving too much attention, interest is directed to other and equally important channels by specific questions and directions.

After getting the class calendar well under way, the suggestion is made that those who are so disposed may make individual calendars. The amount of pleasure and benefit derived in working out such a calendar is so gratifying that one is well repaid for all the extra trouble.

The following is an example of what may be done by an average student in the Training School, with limited opportunities for outdoor observation. This calendar was not prepared or edited for publication. It is submitted exactly as it was handed in by the student for rating.

(PUPIL'S NOTE: This calendar was written under conditions which I expected to find unfavorable, for I live in an apartment house. This afforded one advantage, however, for I had a good view of a row of back yards and several of my observations were made from a window of my home.

About thirty percent of the total number of observations were made

in this way, and on my walks to and from school. Two visits to Prospect park and one to Bronx park swelled the number.

The remaining seventy percent were made during two week ends, when I had the good fortune to spend two or three days in the country, where the opportunity to observe is, of course, larger than in the city.

MARY LOUISE HARTICK).

DATE.	PLACE OF OBSERVATION.	OBSERVATIONS.
Mar. 13	Forest Park	Hepatica in bud.
Mar. 21	Prospect Park	Snow-drops in bloom.
"	"	Crocus in bloom.
"	"	Tulips 3 inches high.
"	"	Hyacinths 2 inches high.
"	"	Daffodils 2½ inches high.
"	"	Two robins.
"	"	A number of grackles.
Mar. 25	Macon St., Bklyn.	Small leaves on bushes.
"	Nostrand Av., Bklyn.	A caterpillar on walk.
Mar. 26.	Tompkins Park	Forsythia in blossom.
"	"	Leaves on lilac bushes.
Mar. 30.	Putnam Ave., Bklyn.	Willow tree turning green.
April 4	Nostrand Av., Bklyn.	Hydrangea bush in leaf.
April 6	St. Marks Av., Bklyn.	Magnolia tree partly in bloom.
April 9	Prospect Park	Daffodils blooming.
"	"	Crocuses blooming.
"	"	Pansies set out.
"	"	Hyacinths ready to open.
"	"	Horsechestnut unfolding.
April 15	Flatbush	Two starlings.
April 23	Bronx Park	Red bud tree in bloom.
"	"	A few spring beauties.
"	"	Magnolia trees in full bloom.
"	"	Rhododendron bushes showing signs of flowers.
April 26	Brooklyn	Maples, oak, horsechestnut partly in leaf.
"	"	Willows in full leaf.
"	"	Pear tree blossoms showing.
May 1	Ardsley, N. Y.	Large numbers of violets.
"	(Country)	Wild strawberries in bloom.
"	"	Apple trees in blossom.
"	"	Cherry trees in blossom.
"	"	Pear trees in blossom.
"	"	Peach trees in blossom.

Date.	Place of Observation.	Observations.
"	"	Swelling buds on nut trees.
"	"	Anemone in bloom.
"	"	Buttercups.
"	"	A crow, several grackles.
"	"	A wren.
"	"	Thrushes and song sparrows heard in trees.
"	"	Red winged blackbird.
May 5	Bedford Park	Fruits on maple, elm and horse-chestnut trees
May 7	Putnam Ave.	Ailanthus leaves opening.
"	"	Dandelions in bloom.
May 10	Bedford Park	Fruits falling from Maples.
"	"	Elm keys cover the ground.
"	"	Rhododendron open.
"	"	Mountain laurel in bloom.
May 12	St. Mark's Ave.	Azalea in bloom.
"	East New York	Huckleberries in blossom.
"	"	Crab apple blossoms out.
May 13	Putnam Ave.	Leaves forming and flowers dropping from pear tree.
May 28	Grand View, N. Y.	Wild geraniums in bloom.
"	(Country)	Daisies in bloom.
May 29	Grand View, N. Y.	Strawberries growing wild.
"	"	Blackberry bushes in bloom.
"	"	Locust trees in bloom.
"	"	Dandelions gone to seed.
"	"	Several bees and butterflies.
"	"	A number of summer yellow birds.
May 29	Grand View, N. Y.	An oriole.
"	"	A scarlet tanager.
May 30	Grand View, N. Y.	Several wrens.
"	"	Song sparrows.
"	"	A catbird.
"	"	A yellow breasted chat.
"	"	Two thrushes.
"	"	A brown thrush.
"	"	A nest with 2 small robins, which were being fed by their mother.
June 1	St. Marks Ave.	Two cherry trees with fruit.

Date.	Place of Observation.	Observations.
"	"	Syringa bushes in bloom.
"	"	Roses beginning to open.
June 5	New York Ave.	Roses in full bloom.
June 5	St. Marks Ave.	Peonies in full bloom.
June 7	Putnam Ave.	Flowering almond in bloom.
June 10	Ave. C., Flatbush	Catalpa trees have fruit (last year's).
June 12	Putnam Ave.	Honeysuckle blooming.

EDITORIAL NOTES

To avoid possible serious delay incident to the removal of the printing firm to larger quarters, the January number has been issued earlier than had been anticipated. Publication of the Index to Volume VI is therefore postponed until the February number. We regret that it has also been impossible to await receipt of copy from some of our advertisers.

The paper by Principal W. J. Stevens, in this number, is but an index of the general interest recently manifested in nature-study in the city of St. Louis. In the preceding (December) issue appeared a contribution from Principal Lewis M. Dougan, in the form of a clear cut statement of what his school had accomplished on absolutely barren grounds in one year. Practical work of this character may be done by city schools whose principles are prepared to guide teachers and pupils to sane and successful endeavor. Boards of Education and administrative officers who allow educative opportunities to be lost by turning over such activities to hired help may learn much from examples like this.

Full account of the annual meeting of the American Nature-Study Society at Minneapolis, December 30, including the election of officers for 1911, will be published in the February number.

CONSTITUTION OF THE AMERICAN NATURE-STUDY SOCIETY

Article I—Name and Objects

The objects of the American Nature-Study Society are, by publications and by national and local meetings: (1) to promote critical investigation of all phases of nature-study (as distinguished from technical science) in schools, especially all studies of nature in elementary schools; and (2) to work for the establishment in schools of such nature-study as has been demonstrated valuable and practicable for elementary education.

Article II—Members and Fees

Any person interested in any phase of nature-study or elementary science may become a member upon election by the Council. A school or library may be enrolled as a member and be represented at meetings by one of its officers.

There shall be no admission fee. The annual dues shall be one dollar, payable before February first, or upon election to membership. The official publications of the Society shall be sent without charge to members not in arrears for dues. Members residing outside of the United States shall pay the necessary foreign postage on publications mailed. The name of any member two years in arrears for annual dues shall be omitted from the list of members, but may be restored by payment of arrearages or by re-election.

Article III—Patrons and Life Members

Members paying twenty dollars at one time shall be enrolled as life members exempt from annual dues. Any person paying to the Society one hundred dollars shall be permanently enrolled as a patron and entitled to all the privileges of members. All monies collected from life members and patrons shall, under direction of the Council, be invested as a permanent fund and only the income used for expenses of the Society.

Article IV—Officers

1. The officers shall be a President, five Vice-Presidents, a Secretary-Treasurer, an Editor (when the Society assumes financial control of an official journal), ten Directors elected by general vote of the Society, and additional Directors elected by sectional organizations as provided for in Article VI. The President, Vice-Presidents and Secretary-Treasurer shall constitute an Executive Committee for the transaction of routine business authorized by the Council. All the officers together shall constitute a Council with the following duties: Consider and report

to the Society all business proposed for a general vote and manage the business of the Society according to the constitution and by-laws. The term of office for the President and Vice-Presidents shall be one year, for the Secretary-Treasurer and Editor two years, and for the Directors two years (five of the first Directors shall be elected for one year and five for two years).

2. Election of Officers. The Council shall make nominations for all offices and publish them in the official journal before November fifteenth of each year. Members and fellows shall have the right to suggest nominations by mail, and any name thus receiving at least twenty-five votes before October fifteenth shall be published with the nominations by the Council. The annual election shall be held in the last week of December, at a stated meeting if such is ordered by the Council to be held at that time; otherwise by ballots to the Secretary. Members unable to attend any meeting of the Society shall have the right to mail their ballot to the Secretary. All ballots mailed must reach the Secretary before December twentieth, in order to be counted at the annual election. A majority of the ballots voted by mail and in person shall be sufficient for election.

Any section of the Society, as provided for in Article VI, consisting of more than one hundred members may elect a delegate to serve two years as a Director in the Council of the Society.

In case of vacancies the Council shall appoint officers for unexpired terms.

Article V—Official Publications

All official communications approved for publication by the Council shall be published in The Nature-Study Review, which shall be sent free of charge (except foreign postage) to all members whose annual dues have been paid. This journal shall continue to be published privately and on the personal responsibility, financial and editorial, of its Editor or Editors, until the annual income of the Society justifies the Council in assuming the management and publication as the official organ of the Society. Until such official management, the Secretary-Treasurer of the Society shall, before February first of each year, pay to the Editor the estimated cost (not to exceed eighty cents and foreign postage) of the annual subscription for each member whose dues have been paid, provided that the Editor contracts to return at the end of the year any unexpended balance to the Treasurer of the Society.

The members of the Council shall serve as an advisory Editorial Committee for THE NATURE-STUDY REVIEW.

ARTICLE VI—SECTIONS OF THE SOCIETY

Members of the Society in any city, state, group of states, or Canadian province may, with the approval of the Council, organize sections. Any Section with more than one hundred members may elect a delegate to serve as a Director of the Society for two years.

ARTICLE VII—AMENDMENTS

Amendments to this Constitution recommended by the Council and published in the official journal before October first of any year may be adopted by a two-thirds vote of members voting in person or by mail at the annual election in December.

NATURE-STUDY NEWS

MISS LOUISE KLEIN MILLER, Curator of School Gardening, Cleveland, Ohio, addressed the New York School Garden Association Dec. 12. Her lecture was illustrated.

The editor of the Nature-Study Review addressed the Farmers' Club of Carlsbad, New Mexico, December 4, on "Country Schools for Country Life".

PROF. E. L. HOLTON, of the State Agricultural College, Manhattan, Kansas, has started a movement to organize the country boys of that state into the "Rural Life Boy Scouts". The duties of the scouts include the mastery of a large body of nature lore. Further statement of this interesting plan will be given in a later number of the Review.

The annual meeting of the CENTRAL ASSOCIATION OF SCIENCE AND MATHEMATICS TEACHERS was held in Cleveland, Ohio, during the Thanksgiving recess. A popular address by Dr. Harvey W. Wiley, Chief Chemist, U. S. Department of Agriculture, on "Food Facts which Every Citizen Should Know" was one of the features. Valuable reports were presented by the committee on "Fundamentals Common to the Various Sciences and Mathematics", the committee on "Cooperative Experiments in Teaching Science", and the committee on "The Relation of Elementary School Nature-Study to Secondary School Science".

Some of these reports are valuable contributions to education. They will be found printed in the volume of the Proceedings, which will be issued in a few weeks.

Among the resolutions adopted by the association, were the following:

"That this association should encourage the carrying out of experiments relative to the matter and method of instruction, and that the sections should collect and make available to their members approved methods of testing results, to the end that the resulting conclusions may be definite and reliable.

"That we should strive not only for the 'problem solving' attitude on the part of the pupil, but further we should seek to stimulate him into the 'problem raising' attitude, in order the better to gain the full enlistment of his powers.

"That we believe in the recognition and inclusion within our courses of the practical and applied aspects of the sciences, to insure the proper motivation of the work of the pupil, and to 'bring him quickly and surely to the point where he will respond soundly to really significant stimuli.'"

The next annual meeting will be held in Chicago.

Last spring there was held at the University of Illinois a CONFERENCE ON THE TEACHING OF NATURE-STUDY-AGRICULTURE in rural schools. The second meeting of this conference will occur Jan. 19-21, 1911. It will be attended by representatives of the state department, farmers' institute, county superintendents, state normal schools, university, village superintendents and pastors of rural churches.

THE NATURE-STUDY REVIEW A HELP TO TEACHERS

[The following is one of a number of unsolicited letters received from different states, indicative of the usefulness of the special numbers issued during the past year and to be continued in 1911. Others may be printed, outlining what has been achieved by teachers who are ready to carry out specific suggestions.—EDITOR]

EDITOR NATURE-STUDY REVIEW: Thinking that you will be interested in knowing that some of us are putting suggestions from the Review into practice, I take this liberty of writing you.

We began by collecting and naming weeds and studying seed distribution, then followed birds, their habits and food; then came insects. The boys caught and named half a dozen of our common butterflies by the aid of the plate in the September issue.

We had a fine monarch for a pet among some pot flowers for a few days but he finally found his way out. Along with the butterflies we secured a few moths and caterpillars including a polyphemus caterpillar nearly four inches long. We discovered him coming with a caterpillar-hustle down the trunk of a bur oak. He was put into a paper box with some oak leaves, two of which he twisted into a tent, lined it with silk and went to sleep. One tomato worm among our collection was pining away under a monstrous load of ichneumen eggs, or rather cocoons for they had reached that stage.

Three home made fly traps constructed from cast-off window netting served for experimenting with fly baits. These were baited with sugar, syrup, honey, jelly, butter and other such common substances but apple cores and peelings seemed to take the lead in drawing flies. The boys volunteered the explanation that it was because apples are so scrace and high priced. Buttermilk ranked next to apples so far as our experiments went. Flies are thirsty souls. They must have their drinks as regularly as a dutchman. I have often noticed that if I shut the school-house on Friday evening, being careful to leave no water for them to drink, the flies will be dead by Monday; but if any means of slaking their thirst is at hand—even open ink wells or a moist flower pot—Monday morning finds them pert and ready to greet you and your lunch pail with a familiarity only too cordial.

J. S. Lozier.

Arcola, Illinois, Oct. 26, 1910.

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THE
NATURE-STUDY REVIEW

DEVOTED PRIMARILY TO ALL SCIENTIFIC STUDIES OF NATURE IN ELEMENTARY SCHOOLS

VOL. 7 FEBRUARY, 1911 NO. 2

THE SHADE TREE PROTECTORS' LEAGUE OF NEWARK, N. J.

By AGNES V. LUTHER, Director Science Department, Normal School, Newark N. J.

WHAT IT IS

A league of school children organized to aid and protect the street trees of Newark, New Jersey. A band of over a thousand children divided into chapters who this past summer waged active warfare on marauding insects, gave first aid to thirsty trees during the drought and vigorously stirred the earth at the base of the street trees to give the roots a chance to breathe as well as to conserve the moisture.

"MY TREE"

Not content with constructive work alone the children established themselves tree guardians and quickly acquainting themselves with the law, prevented tree injuries and courteously stood their ground with linemen, pavement layers and careless drivers, whom they saw endangering the trees, until the offenders threw up their hands and decided that while they had hoped to escape the eye of the city custodians, the children were everywhere and could not be shaken off.

HOW IT BEGAN

Mr. Carl Bannwart, the Secretary of the Shade Tree Commission of Newark, N. J., leaves no stone unturned in his enthusiasm to aid the city's proteges, the trees, "whose stately growing columns and overarching living rustling canopies of green are such potent elements of the city beautiful".* The Newark Shade Tree Commission has planted since its organization six years ago, nearly

*From A Fourfold Word for Trees, by Carl Bannwart.

fifteen thousand trees along one hundred and eighteen miles of city streets. Confident that the children could be interested in the work, the Secretary originated the idea of the Shade Tree Protectors. The badge was struck off in February, 1909. Before beginning the work Mr. Bannwart blocked out the campaign providing for means to awaken the children's interest, direct the effort, systematize the work, instruct in class-room and field and lay a sound basis for continued effective work. So effective and well organized was the work that the hard-working Secretary of the commission found that he had builded all too well, and that the children, not content with what was outlined for them, in their innocent enthusiasm began to suggest points to the Shade Tree Commission for the extension of its already effective work. Truly these chickens fairly flew home to roost, but nothing pleased the organizer of the League more than just this evidence of the children's good faith.

HOW IT WAS CARRIED ON

Permission being obtained from the Board of Education, the work started in eleven schools, a branch being formed in each. A director, one of the regular teachers, was chosen in each school. Her duties were light, however, the main work being done by the Shade Tree representatives.

A meeting was called, the children's interest aroused by a talk from Mr. Bannwart upon what trees do for us, suggestions made as to what we can do for the trees, and the Branch of the Shade Tree Protectors organized. A name was selected such as the Pioneers, Elm, Maple, Franklin or whatever seemed most suitable. Officers were elected and a place and time fixed for the next meeting. Each child was furnished with a leaflet, "What To Do First" (see page 31) and a blank for him to write his report upon for the next meeting. At the succeeding meeting the children made their reports, another practical talk was given and a second leaflet distributed, "What To Do Next" (see page 32). A feature of the second meeting was the giving out of the badges (see cut) to those children whose reports showed that by direct aid given to the trees they had earned the badge.

Each succeeding meeting gave opportunity for reports but at the same time the children learned a few practical things on some one subject, as "The Recognition of Injurious Insects", "Needs of the Street Trees", "How to Plant a Tree", "How to Know the Trees", etc.

WHAT TO DO FIRST

Shade Tree Protectors' Instructions

SEE SOMETHING

One of the first things is to get acquainted with the trees on the four sides of your block. How many are there? Are they young or old? Pretty healthy or needing a tonic? How many of the Shade Tree Commission's young trees are there? (You will know them by the stake and wire guard). Have you a tree in front of your house? If not, is there one on your neighbor's sidewalk?

DO SOMETHING

Do you think you could manage to give that tree a good drink twice a week, two or three pailfuls each time, letting it sink in slowly. Bring in as many answers as you can to these questions at the next meeting and we will talk them over.

Number of Old Trees in Block.....
Number of Young Trees in Block.....
Health .....
Shade Tree Commission planting.....
How many Trees Watered?.....
How many Times Watered?.....

LEARN SOMETHING

What the Trees do for your Block

Watch the people on these hot days and see how they select the shady side of the street. In waiting for a car see them stand under the shade of a tree rather than in the hot sun. Notice the horse whose master leaves him in the heat, creep up until he gets his head under the grateful shade cast by the branches of the shade tree. Think how hot and sunny the house would be if that tall maple were cut down, which now brings coolness and shade to the front rooms! Many a sick person lies and watches the graceful swaying branches and restful green on the leaves.

Do You Know

That a full-grown tree sends out 187 gallons of water a day through its leaves into the air? Think what a difference that makes in hot, dry weather.

That trees purify the atmosphere? The foliage takes in carbonic acid gas, which gas is deleterious to us, and gives out oxygen, which is healthful—indeed indispensable—to us?

That a tree in front of your house makes it cooler in summer and warmer in winter?

That it increases the value of property? A house with a tree in front of it sells for more than one without.

That half the people do not know these facts and do not appreciate them until someone speaks of it?

That you and I can help the City of Newark by knowing these facts, letting other people know them too and lending a helping hand to the trees?

WHAT TO DO NEXT

Shade Tree Protectors' Instructions

CULTIVATE

The roots of those trees of yours need a breath of air and a good square meal. Are they getting it? Down under the ground the roots are working busily enough, but they have a hard time. Help them by loosening up the soil around the base of the tree once a week. An ordinary garden trowel, spade or a good sharp stick will do it. Then when you water the tree the roots will have a better chance to take in the liquid food from the soil and make a fine tree above ground.

INVESTIGATE

Find out a little about the health and happiness of your trees. Are there any invalids among them? Is there any poor tree that a horse tried to make a meal of? The next meeting of the League will be an experience meeting, when we will talk over what has happened to our trees. Here is a small list of possible tree accidents. You know the Shade Tree Commission has Tree Doctors in its employ. Perhaps we can send the doctor around to your tree to see what we can do for it.

Tree Injuries Easily Seen

1. Are there any of your trees with the leaves eaten away by insects?
.....
.....
2. Have any of them large holes showing decayed wood?
.....
.....
3. Have any of them dying branches due to telephone or telegraph wires? .....
.....
.....
4. Are there any tree trunks badly gnawed?
.....
.....
5. Are any of them being crowded by the sidewalk?
.....
.....

AGITATE

Interest some of the people around you if you can. You notice how curious some of them seem as to what you are doing. That is your chance. Tell them about the League and what you are trying to do. Let the other children in the block help you. They will soon realize as you do that the tree has feelings as well as you and I. Make friends for your tree. We can attend to the foes later.

"Trees are the handiwork of God—
We are banded together in their defence."

WEEKLY REPORT

.....Shade Tree Protectors

From.....19...., to.....19.....

No. of trees watered.....

No. of times watered.....

No. of trees cultivated .....

No. of Violations reported.....

Remarks .....

.....

Member's Name.....

Address.....

Necessity then arose for practical field instruction and the Shade Tree Commission appointed men from their corps of workers to go with the children and show them how to "cultivate", or loosen the earth around the base of the tree. The children were

PRACTICAL INSTRUCTION

shown the eggs, cocoons and larvae of the tussock moth on the trees themselves, and even taught to track the insidious borer to his lair. The pictures show some of this street instruction.

WHAT IT DID

Figures will give little of the vitality of the work, yet something may be gained from the following data. The spirit will show in the anecdotes and illustrations.

MONTHS OF JULY AND AUGUST

One thousand school children at work with varying degrees of intensity. The figures below, however, were compiled from the reports of two hundred and fifty children only.

Ages ranging from 7 to 14 years.

1873 street trees watered at least twice a week. Last summer

will be remembered by farmer and citizen alike as one of unprecedented drought.

9388 waterings reported in writing by the children on the little blanks provided. This takes no account of children who watered the trees and failed to write it down. Also takes no account of the zeal which overflowed into the watering of home and school lot trees.

1939 street trees cultivated by individual children. This does not include "gang" work where groups of boys took it upon themselves to attend to certain streets on their own initiative. One gang alone cultivated 280 trees in two hours, a Shade Tree representative accompanying them to demonstrate the method of cultivation.

457 violations reported in writing by 250 children. This refers to violations of city ordinances as to tying horses to trees, pouring salt water from ice-cream freezers at the roots of trees, etc. No count was made of oral reports given in League meetings.

At one meeting of a Branch particularly interested in the work there were

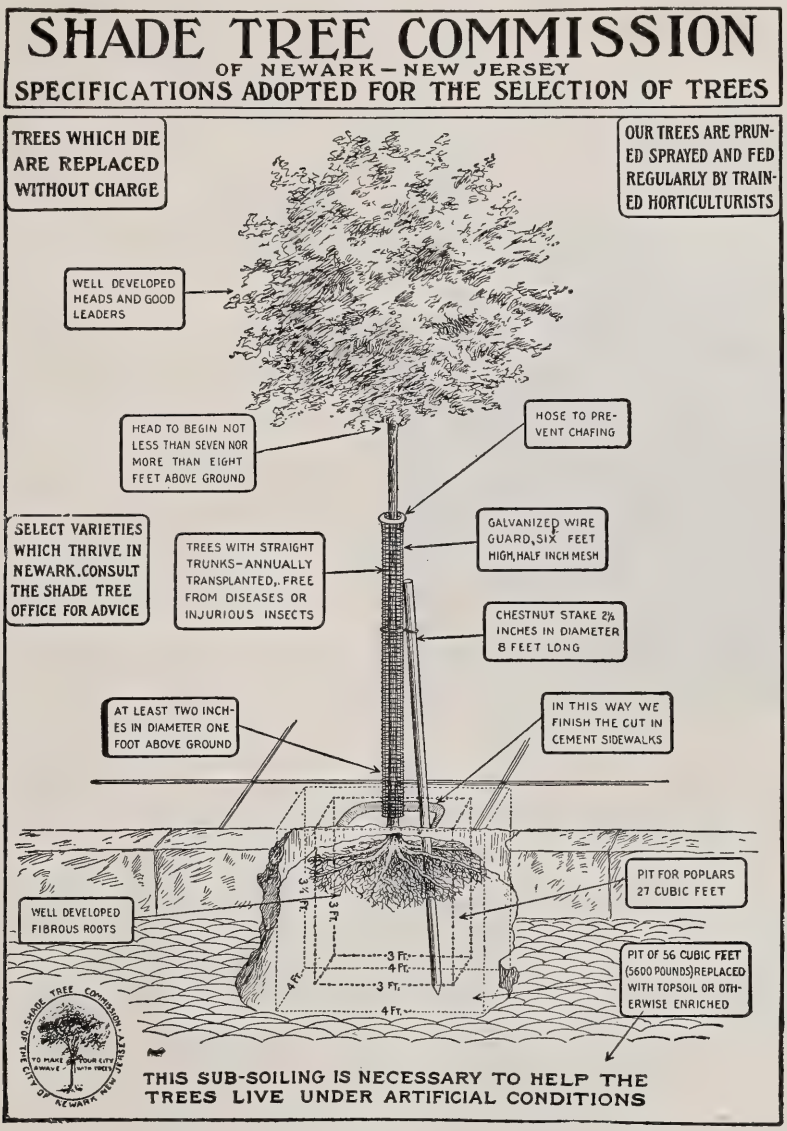
Present, 19 children
Reported since last meeting (two weeks), 183 trees watered
1637 waterings
171 of these trees cultivated
19 violations of city ordinances

ANECDOTES

At first the residents were non-plussed at the children's watering and digging around the street trees (city property) in front of their houses, and not a little suspicious. As soon, how-

ever, as they understood they gave their hearty co-operation. There were few cases to the contrary.

In one instance a little nine-year-old girl tried to water a tree in front of a candy store. The owner of the store came out and told her to mind her own business.



"But I am minding my own business", said the little one gently, showing her badge and explaining. The man was in a temper, however, and would listen to no explanation. Still persisting, he "slapped her face".

"O", said the directress, in questioning the child about the matter, "I hope you didn't say or do anything in return!"

"O no!" and the child philosophically shrugged her shoulders, "I just waited until his back was turned and sneaked up and watered the tree".

One boy had no trees near his home, so he found a pointed iron, went some distance down town and loosened the earth around two hundred and fifty trees.

Little Teddy Yadkowsky held up a contractor on a cement pavement job until he threatened to call the police. Then the boy's face beamed with genuine delight and he said, "O, I wish you would! Then he would tell you, too, that the city demands an opening of four square feet left around all street trees".

SAVING A TREE ABOVE GRADE

The contractor succumbed to Young America, late of Russia.

One girl cared for forty trees for ten weeks.

A little boy of ten years in a plaster cast insisted on working with the other boys to help the trees.

Camillo's postcard speaks for itself, even to the unconscious preemptoriness of the request, "Prompt Answer". He is one of the Shade Tree Protectors' most enthusiastic members, the soul of courtesy at heart and a fine prospective citizen. In his zeal for new members, Camillo made a sign upon a soap box lid, climbed out of his third story tenement and tacked it on the front of the house:—"All children who want to be a member of the Branch brook Shade Tree Commission may ask Camillo. Top floor." Six new members were the result of this unique notice.

Newark, N. J.

(Prompt Answer.)

Dear Mrs. Corwin,

The new members of the league are more interested in the work than any old members of the league. They have been asking me about the badge, because they have seen many violations, and the people would not believe they were members of the club (without the badge.) I am searching and searching every day to find a pointy iron stick so that I can go down High Street and cultivate all of the trees.

Me, Joe and the new members are not forgetters of what must be done to the trees.

Camillo Tipaldi.

Camillo was incited to the hunt for the "pointy iron stick" by the report of the boy previously mentioned.

CHILDREN'S ESSAYS

Read at the general meeting of the officers at the end of the summer. (Spelling intact.)

How I Am Watching The Trees

Tuesday afternoon as I was going through Washington Street Park I noticed that the trees are in need of care very much. They are being destroyed by insects, such as caterpillars and worms. I knocked off very many of them with a stick and stepped on them, but of course not enough to be of any help. It looks very much as if they had no friends, and still they all say they like trees. As for me I could sit under their shade all day if I had them at my home. I hope all the girls and boys of the Shade Tree Commission Club are watching the trees as I. If so we shall soon have the insects destroyed. Then we shall have our trees with bright green leaves, and a pleasure to sit under.

I hope this will receive quick attention, so that our trees will be saved.

Helen Clark
(Lafayette member.)

Why I Am A Shade Tree Protector

Why I like to protect trees is to have our city "awave with trees", and to let our city look beautiful.

Why I am a Shade Tree Protector is to help the Shade Tree Commissioners to take care of the trees.

I protect the trees as if I were taking care of my sister.

I protect 15 trees and trying to protect more. I water these 15 trees 2 times a week and I have cultivated ten of them

Helen Caputo,
Sergeant of the "Olivers"

What I Know About Trees

Trees are the very first plants on the globe of the earth. We could not have any fruit or rubber if it were not for the trees, they bring air, shade in front of our houses, and make it look beautiful, and "we are banded together in their defence." The trees are in front of our houses and also other parts must be watered at least twice a week and cultivated once or twice a week or they will die.

Nearly every year the Newark shade tree commission may have to collect many trees because they died. If we had taken good care of them they would not have died, trees must not be crowded by the sidewalk or any other places they must have much water to grow as we must have food to grow. The groceries men must not throw any salt water on them and horses must not chew the trees. The owner of the house must have some wire around the tree take good care of them. The young trees we are going to be careful of, because their roots are small and they cannot reach to the wells to give them water to drink like the old trees have. The old trees do not suffer much as the younger trees, anybody could have a young tree built near his home for less than $5.00.

Camillo Tipaldi
Treasurer "Branch Brook."

CONCLUSION

To the readers of The Nature-Study Review little mention need be made of the value of such work. Militant nature-study it certainly was. Intensive study of civics it proved to be. The children soon learned the law, the penalty and the court of appeal if no attention was paid to the warning; but best of all they learned the lesson that to win by education and tactful argument was a greater victory than to punish for violation. Such an education of heart and brain driven home by muscular effort and emphasized by the "pointy stick" should count for something in the formation of character.

THE CAMPAIGN OF EDUCATION

HUMAN INTEREST IN TREES

By DR. RUTH MARSHALL, Rockford College, Rockford, Ill.

Our present day interest in trees is more than just a phase of the general conservation movement; it reaches back to something deep and fundamental in the experience of the race. Back in the beginnings, we find that trees were held sacred, either as gods or as their temples. In the art of Egypt and Assyria appears a sacred tree from which came superhuman strength. A Scandinavian myth tells that man and woman were made from trees, the man from the ash and the woman from an elder bough. The oak was Jove's tree, and it was sacred also to Thor. The Druids performed their rites in the forests, and we have the story of the tree of knowledge in Genesis. The Christmas festival is rich in memories of the Yule log and the Christmas tree. Read the tales of King Arthur, or English history down through the days of the Edwards, even to the present time, and see the place that trees have held in the life of the poeple.

There are certain stages in the interest in trees which will be found in the history of all of the nations of the North. They are repeated in our own land. First, in pioneer days, trees were regarded as enemies, harboring Indians and wild beasts; moreover, there was need that they be cut down and destroyed as fast as possible to make clearings for the homes and farms. But as the settlements grew, lumber became necessary for the various developing industries. This period naturally led to the period of exploitation, when trees came to be recognized as valuable assets to the country, and they were no longer cut down merely to be gotten rid of. The forest receded rapidly, but the railroads opened up, and coal supplanted wood as fuel.

This wasteful use of forests quickly brought on a shortage of timber which led to a tardy realization of their value. How to save the forests from rapid destruction, rather than how to cut them down as soon as possible, now became the problem, a problem no longer a local one but national in scope and raising the question of the power of the federal government. And last is the constructive period, the period which we have now entered, the period of systematic forestry. The trees are a crop, to be treated as other crops are treated, to be conserved and used, a source of national wealth and a necessity in national life. Forestry is no new subject, though this country is just learning its first lessons in it. It has been discussed for two thousand years. Every nation must come to it sooner or later. Forestry has been

practiced, it is said, by every civilized nation except Turkey and China. It has been called the yard-stick by which we can measure a nation's civilization. Most nations of Europe and Asia are rich in forestry experience. Those that have spent most have reaped the largest returns.

Our interest in trees today should rest on true values, not alone on sentiment. Trees are not all equally valuable. There are about five hundred species in the United States; the great mass of wood comes from a few. In many places there are not trees enough, but in some places there are too many, for most land must produce grain. Willis L. Moore, of the United States Weather Bureau, says: "Forests must be preserved for themselves alone or not at all"; and contrary to the popular belief, he argues that they have nothing to do with floods.

The material value of trees in the past is seen in the example of Wisconsin, where lumbering was preeminently the industry which built up the cities and towns and which in 1890 still claimed one-sixth of the taxable property. Fifty years ago this state possessed the most valuable pine forests in the country. Today these forests are practically gone. The worst destruction occurred about fifty years ago. The land was stripped of its trees as rapidly as possible, the lumberman saving perhaps forty per cent of the lumber. The rest was left as "slash". Forest fires supplemented destructive lumbering. Of all the foes of the forest, none are so terrible as man. Millions of dollars worth of lumber was burned and with it whole settlements were destroyed and hundreds of lives were lost in the flames.

Even in 1909 lumbering in the United States was ranked as the fourth greatest industry. Prices rose rapidly, even though substitutes were being found for wood. Today more is being used than ever before, three times as much as is produced. At the present rate, our supply will be exhausted in thirty years. The decrease in the amount of timber through destructive lumbering and forest fires can be checked; other losses, such as those from sheep grazing, and from natural causes, as fungus and insect enemies, can be reduced. But this is not enough. There must be a constructive policy looking toward the end of regaining the forests.

We would do well in this connection to learn from the experience of Germany. This nation has passed through the same stages as we have. But the Germans have applied scientific methods with great success in securing through a long series of years an increasing output of timber and increasing profits. The policy

begun one hundred and fifty years ago, when shortage of lumber was threatening, was simply the policy to cut no more than was produced, and to increase the production of the forests until they should supply the needs of the nation. In seventy-five years the amount increased threefold and the money value is ten times what it was sixty years ago.

We still have left 144,000,000 acres of forests. We have scarcely more than begun to attack the problems of forestry. Public sentiment must be created and directed. It becomes necessary that the public schools assume a part of this work. The more or less weakly sentimental talk about trees should give way to a truthful study of trees, their recognition, their value in a material way to the whole people, their right use and protection. With this sane teaching, there need be no fear that the true sentiment, deep-rooted in race experience, the heritage of us all, the interest in trees and the love for them which leads us to seek our inspiration and rest "among green trees", will ever lack expression.

PUPIL'S OBSERVATION OF AN ANT'S NEST

Reported by GRACE J. BAIRD, Instructor in Biology, High School, Urbana, Ill.

Following is the report of one of the zoology students in Urbana High School, where a nest of little brown ants was observed. The ants were found by the class during one of their field trips, and were transferred from the corn plot to a Lubbock nest made according to the suggestion in the September number of the Nature-Study Review.

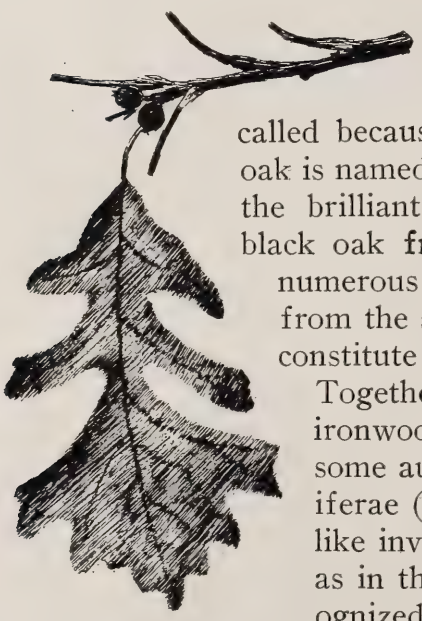
"The ants seem to need water, for they go to the sponge soaked with it, and suck out the moisture, or carry away small pieces having water in them, and they have made a rubbish pile of the small pieces of sponge after using the moisture. They seem to like sugar, for they will carry the grains away from the pile, as if storing food in the nest. All these ants seem to be workers. They are very industrious and keep their nest clean. They evidently recognize the others around them, for they feel of each other with their antennae, and they go in crowds to help each other. They will crawl down near the water, and with their first pair of legs wash their faces and antennae. They cannot swim, but drown if they get into the water."

THE OAKS

By FRED L. CHARLES, University of Illinois

Nearly everyone knows an oak tree at first sight, but how many are there who can readily distinguish one species of oak from another? Yet each species has its individuality and a little practice in identification will enable anyone to recognize the more common forms, even in winter. The most opportune time to begin this study is in the fall, when the members of the oak tribe are vying with one another in their annual display of color. In northern Illinois this exhibit is at its height during the third week of October. The nut trees and the elms, the basswood and the hard maples have led the way and now it remains for the oaks to tint the groves with hues of autumn sunset. Brown, orange, red, scarlet and purple betray the trees of varying habit and after most of the other deciduous forms have parted with their foliage, certain of the oaks still cling to their dead leaves, retaining them until the spring rains come.

The origin of the names of the various oaks is interesting. The white oak receives its name from the color of the bark and the wood; the bur oak is so called because of its mossy acorn cup; the red oak is named from its wood, the scarlet oak from the brilliant autumnal hue of its foliage, the black oak from its bark, the pin oak from its numerous slender branchlets, and the post oak from the service to which it is put. The oaks constitute the genus Quercus (Latin for Oak). Together with the birch, alder, hazel-nut, ironwood, chestnut and beech, they are by some authorities placed in the group Cupiliferae (cupule-bearing, referring to the cup-like involucre of the acorn). In literature, as in the crafts, the oak has ever been recognized as the symbol of strength, the most majestic of our forest trees, "famed for longevity". It is one of the most valuable of timber trees.

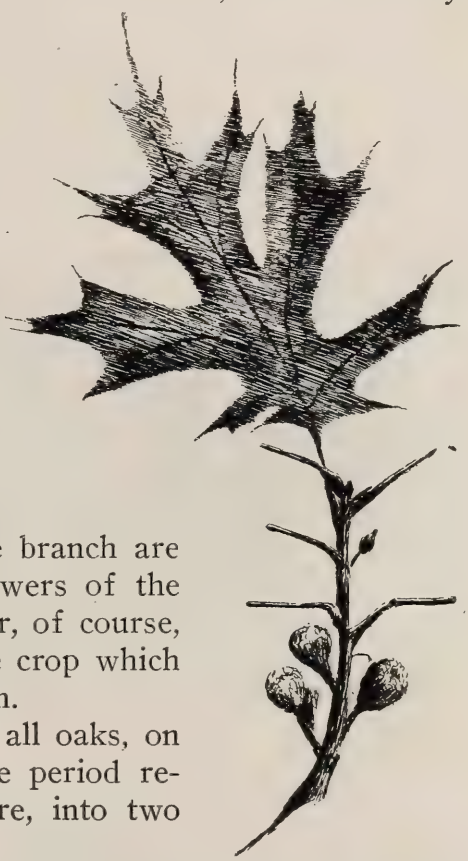


BUR OAK TWIG WITH YOUNG ACORNS

On every twenty-year-old oak when in bloom—does your calendar tell when the oak tree bears its blossoms?—we find two kinds of flowers, the staminate flowers, borne in slender drooping catkins, and the pistillate flowers, which occur singly or in small

groups on very short stems in the axils of the springtime leaves.

If we examine a branch of the bur oak in the late spring after the fruit has "set", we shall find in the axils of the leaves tiny acorns, successors to the pistillate flowers. If we follow the history of the nuts through the season we shall see them growing rapidly until in mid-October they have fallen from the tree and are urging their roots into the ground during the propitious days of Indian summer. Oaks which thus mature their acorns in one year we may designate as "annual-fruiting". If, now, at the same time, we examine a fruiting branch of the scarlet oak, we shall find a different state of affairs. As in the case of the bur oak, we discover tiny acorns supplanting the pistillate flowers, but in addition to these and much more noticeable are larger acorns which, although of considerable size, are evidently "green". Following the career of these larger acorns we find that they mature and drop in autumn, while the smaller acorns, although much larger than in the early summer, are still unripe. Hence it is apparent that the scarlet oak requires two years to mature its acorns; or, as we say, it is biennial-fruiting. The minute nuts just forming in the late spring are the product of season's flowers, while the larger acorns found on the same branch are yearlings, the product of the flowers of the previous year. During the winter, of course, the scarlet oak retains the unripe crop which is to mature the following autumn.



SCARLET OAK TWIG IN THE SPRING SHOWING YEARLY ACORNS AND ONE JUST FORMING

In general, we may arrange all oaks, on the basis of their leaves and the period required for their acorns to mature, into two groups:

(1) The White Oaks, whose leaves have rounded lobes and are without bristles. These species are annual-fruiting,—that is, their acorns ripen in one year. Examples of this group are the White Oak, Bur Oak, Post Oak, Yellow Chestnut Oak, or Chinquapin, and others;

(2) The Red Oaks (also known as the Black Oaks), whose leaves have pointed lobes tipped with bristles. The members of this group are biennial-fruiting, the acorns (produced each year) requiring two years to mature. Examples are the Red Oak, Scarlet Oak, Black Oak, Pin Oak, Spanish Oak and others.

The Scarlet Oak is easily recognized in winter by its habit of holding its sered, brown leaves from October until late April. In the open, apart from other trees, it adopts a spreading form, but in close timber it sends its trunk up to the light above and the lateral branches are short, making a more slender tree. There is considerable resemblance to the red oak, but the bark is more fissured and scaly and there are more small, scraggly branches arising from the trunk. Acorns are oval, the cup including nearly half of the nut, which is often striped with narrow black lines. During the third week of October the leaves reach their climax of scarlet color. The name of black oak is often applied to this tree.

The Red Oak is distinguished by its broader and less indented leaf, which in the autumn shows yellow quite as much as

1. WHITE OAK 2. BUR OAK 3. RED OAK 4. SCARLET OAK A-B, DIFFERENT FORMS OF LEAVES FROM SAME TREE; THE HIGHER BRANCHES USUALLY PRODUCE THE MORE DEEPLY LOBED LEAVES

red. The general character of the tree suggests the hard maple, for which it is sometimes mistaken by beginners in tree study. The trunk is smoother than that of the scarlet oak and freer from small irregular branches, giving it a more trim and open framework. These characteristics, together with the fact that the leaves are shed in the fall, make winter identification possible. The acorns are also a means of recognition; the nut is very large

while the cup is only a well rimmed shallow saucer covering merely the base of the nut.

The Bur Oak in winter is a rugged, "burly" tree, with heavy blunt branches and dark, furrowed bark. Perhaps its most interesting feature is the acorn, whose deep "mossy cup" largely covers the nut. The leaves are sometimes very large. The apical third is separated by two deep, rounded sinuses from the remainder of the leaf, which is many lobed. There is no bright autumn coloration; it is yellowish at best, but oftener a plain yellowish brown.

The White Oak is a noble tree, distinguished by its light gray, shallow fissured bark, its warty-cupped, sweet acorn and its very deeply lobed leaves, which assume a blood purple color in the fall, making the tree a very showy feature of the distant landscape.

OUR FRIENDS THE TREES; READING LESSON FOR GRADE II

By Emilie Yunker, Louisville, Ky.

How wonderful are the trees! They give us nuts and fruits to eat. Where would the squirrels be if there were no nuts? What would the birds do if there were no trees? Some of them would have no homes and no food. A dreary world this would be without our friends the trees.

The world is using up its trees. Let us plant more. We need them for furniture, for medicine, for fire-wood, for tanning leather, for building houses and ships, and for their beauty and shade.

THE GINKGO

By EMILIE YUNKER, Louisville, Ky.

Interesting to nature lovers was the recent discovery made concerning two Ginkgo trees in our own city, which bore abundant fruit this past summer. Neither had borne fruit before. One of the trees measures about eleven inches in diameter three feet from the ground.

The fruit resembles a persimmon; it is not nearly so palatable, however. It contains a nut much like an apricot seed, whose surface is satiny, the color of old ivory. We are told that the nuts roasted or boiled are sold in the markets of China and Japan. So rare were these seeds at one time in Kentucky that a few years ago one hundred dollars' worth of shrubbery was given in exchange for the seed from the tree growing on the grounds of the old Military Institute at Farmdale near Frankfort, Ky., now the Deaf and Dumb Institute.

The leaves of the Ginkgo are spread out like a lady's fan, resembling closely in form those of the maiden hair fern; hence it is often called the Maidenhair Tree. The leaves are thick and leathery, turning a dull golden yellow in the autumn.

This tree is of noble type and quite high bred. In form, it is wonderfully attractive, making an excellent tree, valuable for its shade as well as its beauty.

The Ginkgo's history is recorded in the rocks. Long ago, preceding the coal period, when ferns and palms were trees, many species grew on this earth. Today, but one species exists —Ginkgo biloba—native only in the forests of China, in which country it is planted to guard temples and other sacred places.

According to Kaempfer, the first record of this tree was from Japan in 1690. It was introduced into Holland, then into England, and in 1748, by Alexander Hamilton to his garden containing rare trees, near Philadelphia. In the early forties, Henry Clay, receiving some Ginkgo trees from a collection brought to Washington by an embassy from China, sent three to Kentucky. One was planted in Lexington, one near Frankfort, the third no one knows where. At Central Park, Louisville, there is a fine specimen which measures eleven feet in circumference three feet from the ground. This is most likely the other tree.

Through the generosity of Mr. Robt. Campbell, Supt. of Cave Hill Cemetery, and Mrs. N. Bloom, many seeds have been distributed and planted.

A young tree, the seed of which was planted in a flower pot

seven years ago and later transplanted to the garden, is now seven feet tall. At the same time, several others planted in this city bid fair to become useful as well as ornamental trees. There are about thirty Ginkgo trees in the parks and on the lawns of Louisville. Most of these are in the heart of the city and all are splendid specimens.

These trees have been planted extensively in Washington. The splendid avenue of Ginkgoes on either side as you approach the Agricultural Building is an object of pride to Americans, and has been greatly admired by foreigners.

Why not plant more of these wonderfully attractive trees? The thick leathery leaf is insect proof, as is the clean trunk, which is never attacked by beetles. If seeds cannot be obtained, cuttings can successfully be rooted.

THIS CITY APPRECIATES ITS TREES

MINNEAPOLIS MEETING OF THE AMERICAN NATURE-STUDY SOCIETY

The fourth annual meeting of the A.N.-S.S., held Friday, December 30, 1910, attracted a considerable number of members from several different states. The morning session was devoted to the general topic, "The School Garden as a Nature-Study Laboratory". Garden work in Minneapolis was presented by Mary D. LaRue, Principal of the Pierce School, who gave an interesting account of work done under her direction. She exhibited views of the children's gardens and displayed pupils' hand-work in nature-study, art and language. She was followed by Mr. Leroy J. Boughner, editor of the Minneapolis Tribune, who gave the experience of that paper in encouraging vacant lot gardens. Mr. D. Lange, Principal of the Humboldt High School, St. Paul, and author of "Handbook of Nature-Study", then told of garden experiences in the St. Paul public schools, from which interesting conclusions were drawn.

"South Chicago School and Home Garden Work" was presented by Prof. Otis W. Caldwell, President of the A.N.-S.S., whose admirable stereopticon veiws and graphic description of backyard gardens in poor districts carried a message to all interested in childhood. J. A. Drushel, of Teachers' College, St. Louis, outlined "School Garden and Greenhouse Work in St. Louis". His talk was illustrated. Several members participated in the discussion of the general topic.

At the business session the Secretary-Editor reported that the close of the year 1910 showed a paid-up membership exceeding 1100, and a small balance in the treasury.

The following officers were elected:

President—B. M. Davis (Ohio).

Vice-Presidents—G. H. Trafton (N. J.); S. Coulter (Ind.); F. L. Stevens (N. C.); F. L. Holtz (N.Y.); and D. J. Crosby (D. C.).

Directors—Ruth Marshall (Ill.); E. B. Babcock (Calif.); J. Dearness (Ontario); Otis W. Caldwell (Ill.); and Anna B. Comstock (N.Y.).

The following directors hold over: L.H. Bailey (N.Y.); C. F. Hodge (Mass.); C. H. Robison (N. J.); S. C. Schmucker (Pa.); Delia Griffin (Vt.); Grant Smith (Chicago section); and J. A. Drushel (St. Louis section).

The New York section has not yet elected its director for 1911. The California section has reached one hundred members and is now entitled to a director.

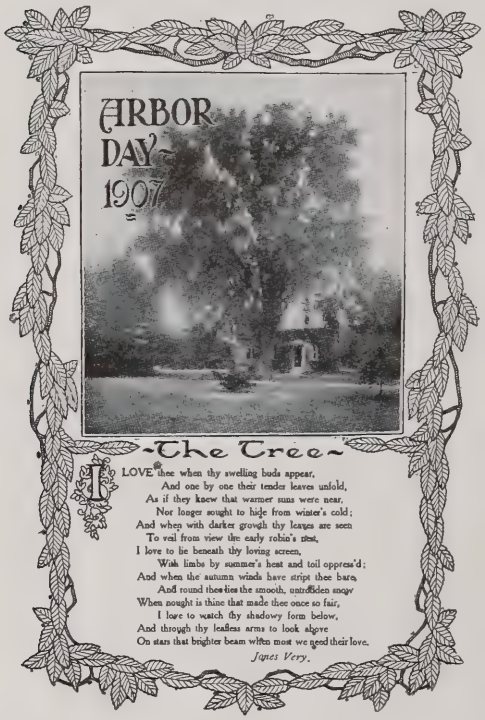
The afternoon session considered two topics. The first, "Natural History Museums in Relation to Nature-Study Instruction", was discussed by I. B. Meyers, who briefly presented "The University of Chicago, School of Education Plan", and J. A. Drushel, who outlined in detail "The St. Louis Plan", showing lantern views. Mr. Drushel's paper was a very complete statement of the organization and work of the St. Louis Educational Museum, an institution which, dating from the World's Fair of 1904, has developed into one of the most prominent and useful features of the educational system of that city. A general statement of the work of this museum appeared in the Nature-Study Review for April, 1910, and it is hoped that Mr. Drushel's paper may be published in full in an early issue of the Review.

The second topic, "The Organization of Nature-Study", was discussed by I. B. Meyers, Fred L. Charles and Otis W. Caldwell. Mr. Meyers read a very carefully prepared paper on "Our Present-day Outlook into the Teaching of Nature-Study". Mr. Meyers has been devoting the year to the investigation of special problems in nature-study teaching. A portion of his paper will appear in a subsequent issue of the Review. Mr. Charles made a plea for "The Standardization of Nature-Study", urging that the A.N.-S.S. has an important though difficult function to perform in endeavoring to define nature-study aims and principles and working toward the establishment of acceptable standards in the wide field it has to cover. The closing paper of the meeting was given by Prof. Otis W. Caldwell, who spoke on "The Organization of the Course in Elementary Science for the Grades". His talk was most helpful, consisting of generalizations based upon experience and regarded as fundamental to any elementary course in the materials of nature-study. His paper will appear in a forthcoming number of the Review as the second of a series, the first of which appeared in the Course of Study Number, October, 1910.

ARBOR DAY AID

[EDITOR'S NOTE: The following appreciation of service rendered to the school will be suggestive to teachers and administrators of aid which may be more readily obtained than is commonly realized.]

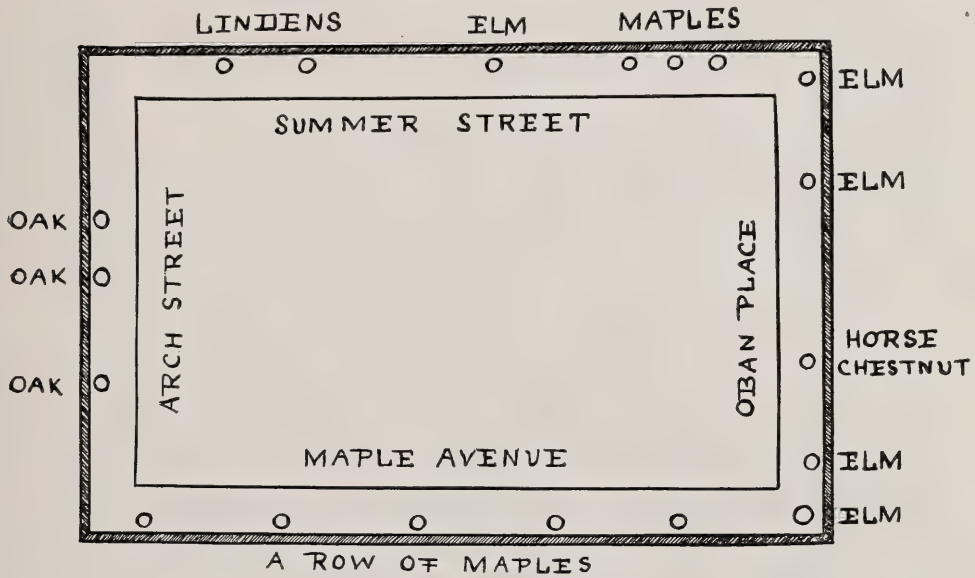
The cry for Arbor Day literature suddenly makes itself heard about the middle of April, rises in a crescendo, deafens the ears of the town librarian and then too often remains unanswered when the hard-worked teacher falls back upon "Woodman Spare That Tree", or some other historic anchor of the storm-tossed pedagogue.



One city of the Union, however, gratefully remembers the aid given it by a city department in no way connected with the schools. The Shade Tree Commission of Newark, N. J., at its own expense and upon its own initiative, published and distributed Arbor Day literature for the school children of the city from the year 1907 to the present year. In 1907, they distributed 10,000 four-page illustrated leaflets to the different grades. In 1908, 35,000 were given to the primary children and 15,000 eight-page leaflets to the grammar schools. 2000 copies of Secretary Bannwart's illustrated "Four-fold Word for Trees" were given to the high school pupils. In 1909 there were 20,000 most attractive color prints of a maple leaf with appropriate literature on the back given to the school children of public, private and parochial schools. The grammar grades received 40,000 booklets especially designed for them, while each teacher in the city, fifteen hundred in number, received copies of Laura E. Richards' "The Tree in the City", reprinted by the Shade Tree Commission by courtesy of the publishers.

In addition to this, to each of the schools the Commission sent a notice offering to furnish trees free for planting upon Arbor Day and to supervise the work in each case. Arbor Day

was a busy day for all concerned, but most of all for the Secretary of the Shade Tree Commission, whose faith in the education of future citizens by every means in his power, never wavers. In the field, the foremen's amused faces on the day set for planting, as the children's little feet stamped the earth vigorously in



"With the school boys and girls making a census of the trees of their home blocks, it will not be long before each maple and elm, oak and linden, will have its name and address in the City Tree Directory and Newark will have a list of which it may well be proud."
(From Shade Tree Commission's Arbor Day Leaflet, 1908.)

their attempt to pack it firmly around the roots, showed that the men, too, were in harmony with the scheme.

It is safe to say that no Shade Tree Commission in the United States has carried on the campaign of education more systematically and generously in addition to all of its regular work than this Commission of the manufacturing town of Newark, New Jersey.

EDITORIAL NOTES

The American Nature-Study Society has experienced a very successful year under the able presidency of Prof. Otis W. Caldwell, who has been prominently identified with the society from its inception and who continues in the Council as a director. The first president of the society, Dean L. H. Bailey, of Cornell University, and the second president, Prof. C. F. Hodge, are also directors. The fourth president, Prof. B. M. Davis, of Miami University, Oxford, Ohio, is recognized as one of the leaders in the nature-study-agriculture movement in this country. Prof. M. A. Bigelow, whose return from Europe was welcomed by nomination for the presidency, withdrew his name in favor of Prof. Davis.

The A.N.-S.S. has been fortunate in its leaders.

Reports of the growth of the A.N.-S.S. have been interpreted by some as indicating that the society is now assuredly upon a sound financial basis. Such, however, is not the case. The expenses involved in the publication of the Review and in the details of the secretary's office are so large that with the limited funds available it is very difficult to make ends meet. The co-operation of all interested in the welfare of the society is urged with all seriousness, to the end that our membership and subscription list may be very greatly increased during these spring months, when nature-study generally is at high tide.

Occasionally letters come to this office from members reporting failure to receive the Review. In many instances the explanation lies in the fact that the subscriber has changed his address without notifying us. Forethought in such cases will avoid delay and possible annoyance.

A number of quantity orders for copies of the Review have been received recently from science teachers, county superintendents, Audubon Society and educational institutions. About four hundred of the March, 1910, (Bird Study) number have been used in this way. The September Insect Studies and December Weather Studies have proved likewise especially popular. Normal school classes, in several instances, have made general use of this material, and the A.N.-S.S. will be pleased to fill further orders of like character at reduced rates so long as the supply

of copies lasts. These teaching numbers, of permanent interest, are listed elsewhere in this issue.

The Nature-Study Review is indebted to the Shade Tree Commission of Newark, N. J., for the use of the illustrations in Miss Luther's article which are not credited to the author, and also for that on page 47.

NATURE-STUDY NEWS

Miss Ellen Eddy Shaw, in addition to conducting her department in the Garden Magazine, is now supervising nature-study work in the Ethical Culture School in New York City.

Dr. Snedden, the new Commissioner of Education in Massachusetts, has begun a series of conferences with the science and nature-study teachers of the State Normal Schools with a view to formulating a new course of study suitable to prepare for the teaching of nature-study in the first six grades. Dr. A. E. Lambert, of Framingham, is chairman and Roland W. Guss, of North Adams, is secretary of the committee.

Miss Emmeline Moore, formerly of the State Normal, Trenton, N. J., sailed January 18 for South Africa to serve as Director of Botany in Huguenot College, Wellington, Cape Colony, while the regular professor, Dr. Bertha Stone, is on a year's leave.

Mr John Davey, founder of the "Bird and Tree Band", is starting upon a five months' lecture tour in the interest of tree and bird protection. Literature on "The Bird and Tree Band" may be obtained from Miss Anna M. Nutting, Box 300, Kent, Ohio.

A delegate meeting for permanent organization of the Illinois Federation For Country Life Progress will be held at Bloomington, Ill., Monday, February 13, 1911.

The American Breeders' Association held its seventh annual meeting at Columbus, Ohio, February 1-3, as guests of the National Corn Exposition. The program included papers on the improvement of farm crops and animals, and nut and forest trees; the breeding of fur animals, fish, bees and wild birds; eugenics; pedagogics of breeding, principles of heredity, and other topics of like nature and importance. Among the

speakers were many of America's greatest living scientists. Hon. W. M. Hays, of the U. S. Department of Agriculture, is secretary of the association.

PROF. FRANK H. HALL, Superintendent of the Illinois State Farmers' Institute and widely known as author of text books and lecturer, died at his home in Aurora, Ill., in January. He was the inventor of the typewriter for the blind.

THE NEW YORK CITY SECTION OF THE A.N.-S.S. has elected as its executive committee for 1911 the following members: Miss Anna M. Clark, Head of Dept. of Nature-Study and Geography, New York Training School for Teachers, chairman; G. H. Trafton, Supervisor of Nature-Study, Passaic, New Jersey; Miss Jean Broadhurst, Dept. of Biology, Teachers College; and F. L. Holtz, Brooklyn Training School for Teachers.

NOTES ON PERIODICALS AND BOOKS

Natural History in the Grades is the title of a series of strong articles by Prof. Otis W. Caldwell which have been appearing in the Elementary School Teacher, beginning in November, 1909, and concluding in October, 1910. Each article treats of one grade, outlining materials and methods and selecting certain topics for somewhat detailed treatment, thus establishing a progressive course. The series is a contribution to the literature of the nature-study course.

Agricultural Education is the general theme of another series of articles in the Elementary School Teacher, beginning with November, 1909, and continuing through 1910. The author is Prof. B. M. Davis, of Miami University. The history and organization of agricultural education in the United States is admirably outlined in these articles.

Evolution of Aim and Method in Nature-Study is ably discussed in the Elementary School Teacher for December, 1910, and to be continued in a later number.

The School Garden is the topic of a pamphlet by C. A. Stebbins, of the California College of Agriculture, Berkeley. It is descriptive of garden work at the Chico Normal School, where the author was formerly instructor. Though brief, it affords many helpful and concrete suggestions. **Guide to the Birds of the Pacific Coast** is another publication by the same author, also issued by the State Normal School. Chico, California. (Bulletin No. 2, Second Edition, 1910.) An introduction on the economic value of birds is followed by a well-prepared and illustrated "Bird Guide".

The Use of the Score Card in Rural Schools is very fully treated in a bulletin (Vol. II, No. 2) of the State Normal School, Cape Girardeau, Mo. The subjects treated are corn, horses, and dairy cattle.

Experiments with Plants and Soils in Laboratory, Garden and Field. By F. E. Edwards, with an introduction by Leroy Anderson.

(Circular No. 58, Nov., 1910, College of Agriculture, Berkeley, Calif.) This pamphlet of 33 pp. outlines fifty practical exercises.

"It is hoped that the teacher may find the exercises especially helpful as supplementary work in general science, physiology or botany."

The **Irish Homestead** makes the following comment:

"Nobody ever heard of a famous school book for primary schools. Yet famous books, not school books, have been written for children. 'Robinson Crusoe' has lasted for a couple of centuries. 'Alice in Wonderland' has made two generations of children happy. 'The Jungle Book' of Kipling probably stands a better chance of immortality than any prose work written in English during the last century. We could fill column after column with the names of books for children written by great writers, written not for the school but for the leisure hour. There are no famous school books."

The U. S. Department of Agriculture is devoting increasing attention to the interests of the public schools. Among the recent publications addressed particularly to the schools are the following Farmers' Bulletins:

No. 423—Forest Nurseries in Schools.
No. 408—School Exercises in Plant Production.
No. 409—School Lessons on Corn.

How to Know Some Ohio Trees (Agric. College Extension Bullein, Columbus, Ohio, Vol. VI, No. 3, Nos., 1910) is an illustrated pamphlet which will doubtless be in demand by teachers outside of the state in which it is issued.

Educational Agriculture (Western State Normal School Quarterly, Vol. II, No. 3) by Josiah Main, Dept. of Agric. Education in that institution, is an intensive treatment of a topic of great present-day interest. The author, who had worked several years in this field in other states, has recently gone to Kansas. He presents here a scholarly discussion of his theme. The chapter headings are: limitations of the field as a realm of knowledge; motives; genetic psychology as an aid in organization; the kinaesthetic factor in apperception—reaction and inhibition; a problem in adjustment—position of the various sciences; formal discipline and its transfer; humanistic science, applied science, and agriculture; agricultural arts—habits vs. judgment; collateral or extra-program agriculture; the seasonal order of presentation; other correlated subjects; retardation—admission, graduation and accrediting of students; the laboratory; plots and grounds; agricultural literature.

In an article on **Improvement in Geography Teaching**, by President W. J. Sutherland, State Normal School, Platteville, Wisconsin, the Journal of Geography for December has the following, which will be suggestive to teachers of nature-study:

"In general it may be said that the selection of larger and more pertinent units is fundamental to better results. Units should be larger. Regions should be studied rather than parts of regions in the form of political divisions. Material irrelevant to the life of today should be eliminated. This done, the lesson assignment should assume the form of a problem for solution, an inference to verify, or a principle to develop."

Agriculture in the Public Schools is a new department in the Town and Country Journal, a semi-monthly published in San Francisco,

California. The editors are State Superintendent Edward Hyatt and Professor E. B. Babcock, of the University of California.

Agriculture and Nature-Study for Rural Schools is the subject of Bulletin No. 5, Series X, issued by the State Normal School of Greely, Colorado. The bulletin discusses inefficiency of rural schools, the aims in teaching nature-study-agriculture, how to redirect the work of the rural school, the training of the rural school teachers, and an outline of subjects for the course of study. The bulletin is prepared by H. W. Hochbaum.

Insects and Disease. By R. W. Doane. New York: Holt and Co. 1910.

This new volume in the American Nature Series is a popular account of the way in which insects spread some common diseases of man and domesticated animals. It gives special attention to the house-fly (*alias* typhoid-fly, or filth-fly) as a carrier of the germs of intestinal diseases, such as cholera and typhoid, and even of tuberculosis and other diseases. Three chapters are devoted to the description, classification, general natural history, and relations of certain mosquitoes to malaria and yellow fever. Other chapters deal with the relation of fleas to plague, of ticks and mites to the destructive cattle diseases known as Texas fever, of certain tropical insects to sleeping sickness, elephantiasis, and other diseases for the transmission of whose germs insects have been charged but have not yet been proven guilty. The book will prove a useful compilation of facts which will tend to win popular support for the scientific warfare against dangerous insects. Many of them have already been found guilty of murder in a degree which warrants capital punishment at the hands of an enlightened public; and this book will persuade many intelligent citizens to help with the execution. M. A. B.

Farm Friends and Farm Foes. By Clarence M. Weed. Boston: Heath. 1910.

This is a very attractive book intended to serve as a text and guide for study of certain plants and animals which have an important relation to agriculture. Part I deals with weeds; Part II with insects; Part III with fungi; Part IV with birds; and Part V with mammals. Most of these divisions well contrast the useful and harmful relations; but the "friend" side of the mammals deserves more emphasis; and teachers who use the book would do well to gleam supplementary material from such books as Shaler's "Domesticated Animals" and Wood's "Dominion of Man". Every school library and public library in agricultural communities should have "Farm Friends and Farm Foes". M. A. B.

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THE
NATURE-STUDY REVIEW

DEVOTED PRIMARILY TO ALL SCIENTIFIC STUDIES OF NATURE IN ELEMENTARY SCHOOLS

VOL. 7 MARCH, 1911 NO. 3

A YEAR WITH KATYDIDS

By META SCHLUNDT, Evansville, Ind.

[EDITOR'S NOTE: Mr. Meier explains that the author of this admirable study is a junior student in the Evansville High School, pursuing her first science work in a course of physiology taught from the view point of general biology. We shall be more than pleased to receive similar papers from other sources.]

One day, early in the spring, one of the students in our school brought in a small twig of a grape vine, on which were two rows of small, brown, hard, flattened, oval-shaped bodies, about one-fourth of an inch long. There were five of these bodies in a row, overlapping each other. An insect key confirmed the supposition that they were katydid eggs, although I, at first, made the error, which, I have read since, is often made by people, of taking them for the San Jose scale. A projection of the stem had apparently prevented the depositing of more eggs; for the normal rows, as I found later, are longer. Several weeks later, in the latter part of March, I discovered a twig of

the Red-bud tree with twenty eggs on it, ten in each row. These were put with the others into a covered tumbler and placed on the window-sill of the laboratory, to await the coming of warm weather.

The following months were very unfavorable for the de-

velopment of the eggs, for warm days alternated with cold, damp ones, so that there was no apparent change in the eggs for some time. Just as an experiment, one of the twigs was moistened at intervals, to imitate out of door conditions as much as possible, and the other twigs kept dry.

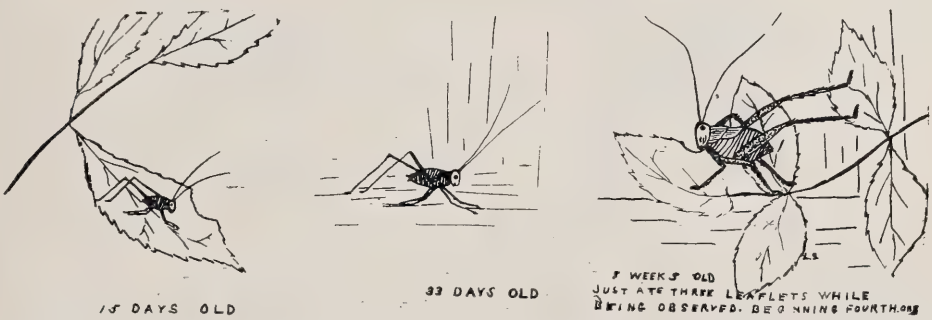
On Tuesday, May 17, after the close of school, I came to the laboratory for a peep at them, as usual; and to my great delight found three, tiny, green, delicate creatures among the rose-leaves in the tumbler. They seemed to consist almost wholly of legs and antennae, but nothing seemed more beautiful to me at that moment than these tiny living creatures. Examination of the twigs showed that they had hatched from the eggs that had been moistened. The "doors" of the shells through which the katydids had made their exits were oval openings at the end of the egg-shells and were about one-half the length of them. The edge was very clean-cut and the inner lining was beautifully brown, glossy, and irridescent. At this opening each insect had left a small, white, shriveled membrane. They were fed daily with fresh roses and leaves after having been put into a larger glass case. Soon more katydids found their way out of the eggs and all ate heartily and consequently grew rapidly.

One of the most interesting facts about the katydids was their protective coloring. Later, in the imago state, this is even more pronounced, the wing covers being not only green but also wonderfully veined like leaves. But even the tiny katydids were so well protected against their enemies that it sometimes required a moment's careful looking before we discovered them among the green leaves. A week after the first katydids had hatched, a sad calamity befell the little company, which was caused, instead of being averted, by this same protective coloring. The janitress, in cleaning the laboratory, came upon the glass receptacle full of withered roses, and all unconscious of the little katydids among them, threw them all out with the trash.

A short time later we were delighted to discover one of them calmly sunning itself on the window-sill, to which place of refuge it had managed to make its escape. Luckily the remaining eggs were also safe; for since the moisture of the roses in the covered tumbler had caused the eggs to become mouldy, we had removed the twig to another tumbler. On this same fatal morning the last katydid emerged from the remaining eggs on this twig, and I was fortunate enough to see it still partly within

the shell, with its delicate antennae folded back close to its head. As soon as it had left the shell, it stretched its legs and crawled to the top of the twig with no instructions whatever in walking. We put this one in with the older katydid, which had become quite a bit larger and of a darker color.

On May 28, I carried them home with me for "exhibition" and brought them back on the following Tuesday. They behaved beautifully during their visit, allowing me to transfer them from one receptacle to another without even attempting to escape. The limited amount of freedom which they pos-

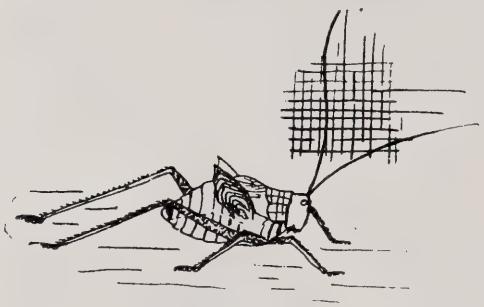


sessed probably produced a lack of energy and agility in them, although they appeared normally healthy and vigorous. On this same Tuesday, May 28, the older katydid went through the remarkable process of molting, or shedding its skin, which it left in a dried, brown condition on the bottom of its house. Even the covering of its tiny legs and antennae was still a part of the discarded garment. As a result of this change it was larger and of a paler green color. A few days later another molt was found, which very probably belonged to this katydid also, as it was slightly larger than the first molt.

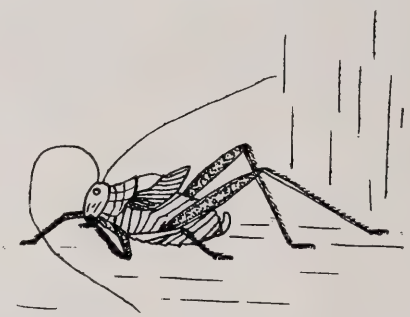
When school closed for the summer, I took them home with me, but a day or two later the younger katydid died. This may have been due to the fact that I had left the covered tumbler in the sun for some time, thus allowing the sun's rays to penetrate the glass and change into heat, but not allowing this heat to escape. The one remaining katydid was soon transferred to a larger case, one side of which was of screening and another of glass. Fresh twigs and roses thrust into the moist soil on the bottom of the cage made a more pleasant and natural "home" for "Katy". The other eggs did not hatch at all, so that from the beginning of thirty eggs, there was only one katydid left. Clearly this seemed to be a case of "the survival of the fittest".

On July 8, I left my little pet in charge of my sister, and

was away from the city for about eight weeks. She made occasional drawings of "Katy" and looked after her very well, for when I returned I should not have recognized the large, beautifully-winged katydid as being the one I had known before. She molted for the last time on August 2 at the age of eleven weeks, and it was then that her large gauzy wings, almost en-



AGE 7 WEEKS + 4 DAYS



A CHARACTERISTIC POSE
9 WEEKS OLD

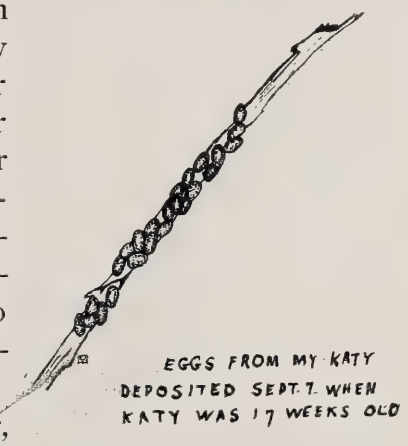
tirely concealed under green wing-covers, appeared. My sister and mother were fortunate enough to witness this interesting process of molting, and declared that it took quite a bit of energy on the part of "Katy" to crawl out of her old skin. We kept the cage in the yard among the rosebushes in order that she might feel less "imprisoned". Soon other katydids came around the cage, and about the middle of August, we captured a male katydid and placed him in the cage, also adding a female katydid from Carmi, Illinois, and one from Tell City, Indiana.

AFTER MOLTING LAST TIME
AGE 11 WEEKS, 2 DAYS.

At the beginning of September we noticed that the dry twigs in the cage had been roughened at places by the removal of the bark. It is quite interesting, it seems to me, to notice the various adaptations of animals to the work they have to do. A woodpecker possesses a hard bill for making holes in the bark; a mouse has its sharp teeth for similar purposes; and a katydid, lacking these devices,

is provided with a serrate-edged ovipositor, with which she may remove the smooth surface of the bark, preparatory to the depositing of her eggs. We now watched the katydids with more interest than ever.

Several days later a gummy substance appeared on the ovipositor of the Carmi katydid. This was doubtless put on the twig to hold in place fourteen brownish eggs which were deposited there in two even rows on September 5. On the following day we found her dead in the cage, her life-work completed. On September 7, our high school katydid, after having prepared a twig in like manner, deposited, to our great satisfaction, twenty-six eggs in a rather disorderly fashion on the twig. Two days later, at the age of about seventeen weeks, "Katy" also died.



Cold weather was approaching, and the brief summer lives of most insects were almost spent. Climatic conditions would not allow the imago insect to live through the winter and continue activity the next summer, as some other insects and frogs do. But instead, safely protected by a firm, hard shell, secure against rain, snow and icy wind, there rests in each little brown egg a tiny "katydid-to-be", ready at the call of Spring to emerge and complete another life cycle as its parents did.

Besides the pleasure and interesting knowledge that "Katy" gave to us during the summer, she made that one family of insects seem like dear friends or old acquaintances wherever I might meet them. It certainly proved worth while to trace this life story from beginning to end and thereby get another peep into the rich, varied, and mysterious sphere of insect life and into nature in general.

On Saturday, March 18, 9:30 to 11:45 A. M., in Fullerton Hall, the CHICAGO NATURE-STUDY CLUB will hold its annual meeting and rally. A strong program has been arranged, including such topics as birds, school gardens, school museums, and assistance in nature-study of the schools by pupils of the teachers' college. Two of the addresses will be illustrated. All interested in nature-study are welcome to this interesting meeting.

NATURE CALENDARS

By CHESTER A. MATHEWSON, Brooklyn Training School for Teachers

The prime object in the construction of these calendars is to stimulate the observation of common normal objects and processes out-of-doors. Incidentally many other aims are fulfilled—individual field-work, self-expression keeping active the "tentacles of inquiry" of the child's mind, and the application beyond the doors of the school of numerous nature-study lessons learned with the teacher.

Teachers in various grades and in different schools will find it convenient to use diverse means to attain these ends. They may have the simple blackboard calendar with symbols to indicate rain or snow, fair or cloudy, hail, warm days and cold, etc. In the upper primary grades this may be varied by having symbols to represent observations following chronologically the progressive changes incident to spring or the retrogressive changes incident to fall. These again may be constructed individually, by groups, or by entire classes. The first is perhaps the best, but the teacher can exercise more control and supervision over the latter, and it may therefore be more efficacious in arousing the interest of the average pupil. Nature writers have long emphasized the necessity of teaching the subject by actual contact with nature, but many teachers without special training and others whose training has been too "special" have failed to see the chance afforded in calendar work for giving the pupil a background of the first-hand nature lore which may be used effectively in the class-room.

Not all of our materials in nature-study are equally good for the calendar studies; on the other hand some are exceptionally useful. The teacher who is on the alert will soon find out what materials are most suited to her class, and plan accordingly.

One of the very best subjects for such study is the trees. In our cities trees seldom reproduce themselves, and they are subject to manifold dangers unknown to them in their natural habitat. Whatever can be done by way of arousing interest in them and spreading knowledge about them may further their growth and preservation—and who is there who does not prefer to live where there are trees in plenty along the streets? Trees afford good materials for this work because of their ubiquity, their perennial character and their size. Whether we are asking a fall calendar or one in the spring, the trees are always at hand

to welcome and answer our inquiries. In addition to written records of the unfolding of the buds, we may record in sketches or paintings the changing aspect of the tree with the steady march of the weeks. For those children who are the proud possessors of cameras there is the great incentive of taking some pictures which will be of more than ephemeral interest. They may be directed to photograph favorite trees on successive dates, thus securing a photographic record of the tree's appearance to accompany their written record. The best times for such pictures are the weeks intervening between the first swelling of the buds and the full development of the foliage. In some common trees, e. g. the chestnut, the blossom appears long after the leaves. In others, e. g. the witch hazel, the long yellow flowers are usually not to be discovered until late fall, often in November. In others the blossoms and even fruits come and go before the leaves appear. Such facts as these are logically noted and emphasized in calendar studies of the proper sort.

More fascinating than the trees, especially for the children, are the birds. Their beauty, and their ease and grace of motion make their appeal to every one who has not become too callous to care for such things. However, the scarcity of the birds, and their shyness make it much more difficult to make them the subject of continued study by classes outdoors. The bird calendar is one means of directing individual study of the birds. The calendar record affords a means of making the children's observations more definite, and the sequential nature of the record helps them to persevere in their efforts to get acquainted with these creatures. Calendars made faithfully and intelligently cannot but give the makers excellent first-hand ideas about migration, migrant visitors, all-the-year-round birds and the like. In addition, if some individual is particularly fortunate it is sometimes possible to get a chronological record of the habits and doings of one bird or of a family of birds, extending over many weeks.

In the higher grades, after the children have acquired a fund of nature lore, there is opportunity to make a splendid application of the things they know by constructing a complete calendar. This would be a record of observed phenomena of a varied character—not merely in connection with birds, trees, flowers, insects, etc., but with all kinds of natural objects and processes. Thus their knowledge of the names of things, of habits, functions, life histories, and in some cases of economic relationships might be extended in a way that would not be possible in routine class work. Their attention might be directed

to many phenomena which would afford a correlation with work in geography—thus, e. g. spring floods, the condition of the soil, lengthening days, variation in the sun's position, etc. Spring is doubtless the best time for making such a calendar. The increase in the number of possible observations as the season waxes allows for a healthy expansion of the children's interest.

The best way to make calendar work connect with the work of the schoolroom is through seasonal displays of the things recorded in the calendar in so far as this is feasible. These assist in giving the calendar concrete form, and allow for the exchange of ideas amongst members of the class. In cities it may easily be possible that the majority of the class get as much material for a nature calendar by their observations on twigs, flowers, etc., indoors as from any outdoor studies.

From the standpoint of the educational value of nature calendars, it will be noted that there is ample opportunity for self-activity, for the stimulation of interest, and for the formation of useful habits. There is also an excellent chance to make use of the good old Jesuit doctrines of rivalry and emulation. Whether the calendar is made in temporary or permanent form, individuals and groups may be put upon their mettle to equal or outdo the efforts of their rivals. By establishing definite habits of observation it may well be that the pleasure and benefits derived from this contact with Mother Nature will continue for many years after formal instruction has ceased. In cities where there is often a dearth of nature materials, these observations often prove to be the saving modicum of first-hand knowledge, which is so essential to the attainment of the best kind of nature lore.

During 1910 the New York City Section of the A.N.-S.S. held three meetings. At one Dr. Hodge spoke; at another, Miss Gallup lectured on the work of the Children's Museum and showed the members about the Museum. At the last meeting Dr. Bigelow gave a sketch of the progress of nature-study in America, and told of his observations in the subject in England recently. At this meeting, also, progress was reported in the revision of the syllabus in nature-study in New York City, and officers were elected. The membership at that time was eighty-eight, —all of whom are national members.

FARM CALENDAR

By O. D. CENTER, Superintendent of Illinois State Farmers' Institute, Springfield, Ill.

[EDITOR'S NOTE: The changing seasons and the activities dependent upon them constitute a large factor in determining the nature-study course. This farm calendar will be suggestive to all readers and particularly to those in the rural schools as indicative of the timeliness of agricultural topics throughout the year.]

JANUARY 1-15

Although there is always a tendency to keep to the house during cold weather, much can be done of value to the coming season's work and much that will mean dollars later on, even at this season of the year.

It is well to keep in mind that the pigs, cattle, horses and sheep all appreciate a good, deep, dry, soft bed of straw. Keep them well supplied. The stable should be carefully cleaned each day and the accumulated manure put directly upon the fields rather than piled up alongside of the stable. Meadows, pastures, stubble fields and corn fields will all be the better off for a dressing of manure. When the manure is hauled directly to the field, the plant food contained therein is leached directly into the soil rather than fermented and wasted.

If the season's supply of meat has not yet been provided, the butchering should not longer be delayed.

JANUARY 15-31

Provide litter generously for the poultry as well as for all other stock. If the hens are kept busy scratching rather than sitting on the roost and accumulating fat, they will prove of greater service. Corn fed in large quantities to the hens is not conducive to heavy egg production. Wheat and oats or dry bran mash mixed with cracked soy beans will be appreciated by the fowls and heavier egg production be the result.

Provide warmed drinking water for all the stock. Do not force the cattle, horses, sheep, hogs or poultry to drink water colder than you would wish to drink yourself.

Provide plenty of forage for the animals in a sheltered place. It is as cruel to force your stock to go to the stalk field and pick their living as it would be to force your children to secure their victuals in a comparable way.

Do not longer put off providing some sort of a seed tester, since the testing of your seed grain ought to begin very soon.

Do not forget that a balanced ration for all the young animals and for the milch cows will insure a proper development in the growth of the animals and a larger milk supply.

FEBRUARY 1-15

Begin harnessing and hitching the colts you expect to use in the season's work. It is advisable to use kindness but firmness in all dealings in the breaking of the colts, and they should be thoroughly broken before the active farm work begins.

Take an inventory of the stock, tools, grain, etc., on the farm.

Begin the testing of your seed corn and save nothing for planting except ears that show a perfect germination. It is well to use no less than six kernels from each ear.

Carefully plan your season's work, for the careful planning and the execution of definite systems of rotation mean greater profits.

Do not neglect a continuation of colt-breaking, since the continued driving and handling of the animals will aid in the amount of work secured from them during the coming season.

FEBRUARY 15-28

Be sure that the seed corn test is completed and that you have a larger amount of seed corn carefully selected than you will need for your season's planting. It is well to fan and grade the seed oats at this time.

The farm machinery should be examined. Any repairs needed should be made. It is well to have the discs and plows sharpened, while if the cultivator shovels are blunted and dull, now is the time to take them to the shop for correction.

Do not start in the season's work with the harness in poor repair. A careful inspection of the harness, followed by repairs wherever needed and by careful washing and oiling, will add much to the life of the harness and the efficiency of the work during the season.

MARCH 1-15

Finish the testing of the seed corn if not already done. Be sure to clean and grade the oats, which may now be treated for smut. The formalin treatment is most effective and most easily applied. Provide the clover seed that you expect to sow in your rotation. If wheat has been seeded, it will be well to examine it occasionally to enable you to sow the clover at the most opportune time.

Put the colts which you have been breaking to a little heavier work. A good place to try them out in company with older horses is on the drag and on the roads. The dragging of the roads at this season of the spring will result in easier travel throughout the entire year.

If the manure has not been put upon the garden and potato patch, do not neglect this longer. It will be best to use stable manure with as little straw in it as possible, since it will more easily become incorporated with the soil and there will be less danger of potato scab following its application.

Repair the pasture fences and trim any large hedge that needs attention. All the odd jobs about the farm should be given careful attention during this month, since the season's work will approach rapidly.

If you grow your own cabbage and tomato plants be sure to get a hot bed going. Trim the berry bushes, grape vines and fruit trees.

MARCH 15-31

Do not neglect to drag the roads repeatedly. It is well to practice this after each shower.

If you have put off the sharpening of the discs and plows until now, do not neglect it longer.

Look carefully after the farrowing sows and lambing ewes and other stock. Provide your mother animals with clean quarters and clean beds. The beds should be changed often and a large quantity of litter provided each time. If you have not already provided materials for balanced rations for the mother animals, by all means do so, since the start which the young are given will determine to a great extent their future development.

Plan to have everything ready for the opening of field work. In the southern districts you can easily begin plowing sod for corn fields, plowing old ground for oats or spring wheat, barley, etc. Do not destroy the crop residue of the previous season. The corn stalks should be cut up with the disc or with the stalk cutter, instead of being raked and burned. The straw stack should be spread uniformly over the field rather than destroyed by fire.

By this time the strawberry bed should have the winter covering removed to the pathways. The lawn will be improved by a dressing of well rotted manure.

APRIL 1-15

Begin sowing oats, barley, spring wheat and other small

grains. Clover should also be seeded in the winter wheat and harrowed in.

If the outlets of all tile drains are not open and free, they should be cleaned out and put in good shape for the rapid removal of all surplus water. On steep hillsides prevent soil washing by constructing temporary dams across the gullies as they begin to form.

Harrow the pastures and meadows not only to break up and distribute the droppings of the animals, but also to loosen up the grass roots and stir the soil a little.

Watch the shoulders and the necks of the colts that are in the harness. Careful attention to this may prevent the ruin of a good horse. See that the collars fit well. If this is done, sweeny is prevented.

Do not neglect to disc all land early this month that is to be plowed later. The discing will induce the germination of weed seeds and prevent the evaporation of moisture.

Rake the lawn, removing all old dead grass and also the surplus of top dressing applied.

Get in early vegetables in the garden, for radishes, lettuce, parsnips, beets, etc., should be growing rapidly.

APRIL 15-30

Keep the plow going steadily on all unplowed land. Follow the plow with the harrow or some other implement that will form a mulch on the surface. Plan to conserve soil moisture in every move you make.

Furnish the lambs with a creep and provide oats or oats and bran in a feed trough inside the creep.

Do not forget that the young pigs need exercise to prevent their getting the thumps.

Be sure that the corn planter is in good shape and that your check wire is free from kinks and of sufficient length to plant the field.

Do not put off the planting of your garden and potato patch until the latter part of the month, but attend to it early. Providing fresh vegetables and a good supply of potatoes for the winter is an indication of good management.

(To be continued)

CALENDAR FORMS

By FRED L. CHARLES, University of Illinois

The uses and advantages of the nature calendar have been well set forth in the paper by C. A. Mathewson which appears in this issue of the Review. As a device for stimulating outdoor observation in various lines and promoting the keeping of accurate records, the calendar has won a permanent place in the schoolroom.

In the primary grades the simple weather chart (Nature-Study Review, December, 1910, page 265) affords an easy introduction to the calendar idea. Frequent reports of seasonal changes in an individual tree, or in the activities of one familiar species of bird, constitute a profitable exercise for young pupils. A cardboard chart upon which are mounted flowers, leaves, or seeds, with appropriate dates, is another means of following the season's advance. The formal calendar, first as common class property and later as individual records, leads to the highest type of phenological study. Such work should not be pushed beyond the pupil's interest, and the field of study should be different in successive grades. As suggestive of the form which the more complete records may take, the following outlines are given as growing out of considerable experience in the work of this character.

BIRD CALENDAR

Name of Bird	First Seen	Abundant	Nesting	Last Seen

The item "Last Seen" involves, of course, a daily record, or bird diary, in which are recorded the names of each species observed for each day. A convenient form for such a record, as suggested in Chapman's "Handbook of Birds", is a "monthly time-book", similar to a teacher's class-book, in which there is a square for each day, and the pages are so cut that a name once entered can be followed through a number of months without re-entering. Thus is obtained a record of observations for each

day and of any one species through the season. The calendar item "Last Seen" must be taken from the last entry in the diary, and is of value as evidence bearing upon the spring date of leaving for the north in the case of winter residents or migrants, or of migration southward in the fall.

FLOWER CALENDAR

Name of Flower	First Seen	In Prime	Dispersing Seed	Habitat

While the "Habitat is not strictly a calendar item, it serves to reveal the significant fact that the earliest wild flowers are to be found in the woods, those of the open fields coming later. In fact, many interesting studies of genuine value grow out of the calendar record when the data are scrutinized for the lessons they carry.

TREE CALENDAR

Name of Tree	Flower Buds Open	Height of Flowering	TwigBuds ("Leaf Buds") Open	Full Foliage	Dispers-ing Seed

It is of interest to note that a large number of forest trees and familiar shade trees bloom before the foliage appears. Where this is true, the pollination is usually by wind rather than by insects. If a more complete record of the year with the trees is desired, carrying over into the fall, the following form may be used:

TREE AND SHRUB CALENDAR

Name	Flower First Seen	Height of Flowering	Dispersing Seed	Leaf Buds Open	Full Foliage	Coloration Begins	Height of Coloration	Leaf Fall Begins	Tree Bare

Other generalizations may be derived from data of seed maturity, leaf coloration and leaf fall, but the teacher must observe caution in holding within bounds the tendency to "explain" phenomena.

An insect calendar is more difficult to organize. For certain groups, e. g., butterflies and moths (Lepidoptera), it may take this form:

BUTTERFLY CALENDAR

Name	Eggs	Caterpillar	Chrysalis	Adult

Some butterflies hibernate in the adult stage, others pass the winter in the egg, others in the larval (caterpillar) stage, while some migrate southward. Insects have been sorely neglected in our nature-study practice, and must some day come into the prominence which their great significance, economic and biological, warrants. Any method of encouraging insect-study is desirable, and if nothing further is attempted it will be well worth while to keep the following very simple record:

INSECT CALENDAR

Insect	First Seen	Abundant	Food

A popular form of record, when not over-done, is the individual "nature note-book", in which observations of interest are recorded systematically, though not necessarily daily. I have obtained more satisfactory results through this means than by any other appeal to those who having eyes, yet do not see. In spring and fall, when the panorama of the seasons is rapidly shifting, weekly summaries may be made from these nature-notes, characterizing each week of the month by features which will prove fairly typical or constant in successive years. The form which I have commonly used in directing such seasonal studies is as follows:

NATURE CALENDAR

Kept by.....

.....

Weekly Summaries for Month of.....191...

First Week

Weather
Trees and Shrubs
- Leafing—
- Flowering—
- Dispersing seed—
- Coloring—
- Shedding leaves—
- Bare—

Flowers
- In bud—
- In early bloom—
- In prime—
- In late bloom—
- Gone by—
- Dispersing seed—

Birds
- Arriving—
- Building—
- With young—
- Leaving—

Farm Activities
Garden Activities

Insects
General
(Plants and animals, outdoor games and sports, home activities, etc.)
Most Prominent Features of the Week

Second Week
(etc.)

As indicative of what may come from such phenological studies, constituting as they do an important element in the organization of the course of study, we may quote the following informal characterization of the four weeks of the month of March, as based upon actual records of several years. The statement applies to northern Illinois, but will be of interest to any locality.

MARCH

March is the teething time of the calendar, the fretful days, of varying mood, smile and frown, cheering sun and disheartening chill, the robin's call from among the swelling maple buds, and then the creak of wheels in unexpected snow. Sun, rain, calm, wind, snow, bird notes, silence, promise, peeping flower-buds, frost, disappointment, poetry, mud, March!

Out from this chaotic sequence, we may select certain characteristics that mark the procession of the weeks. Although the seasons are not so well established, and the outdoor schedule consequently not so reliable as in the later months of spring, we may venture (in northern Illinois) some such prediction as the following:

First Week—

Warm days, with still the possibility of the heaviest snowfall of the winter. The storekeeper places his stock of marbles in the show window.

Buds reported swelling on the elm and soft maple; pussy willows claim the attention even of the unobserving.

Flocks of wild ducks and geese announce their pilgrimage to the north; we see our first robin and bluebird, although we have heard rumors of their presence here for a week or more; meadowlark frequently seen or heard; English sparrow greatly in evidence, gathering material for nest. Horned larks abundant; an occasional redheaded woodpecker appears; here and there a nuthatch, noticed only by the initiated; crows numerous; blue-

jays scolding about the way breakfast is served. Frequent reports of the "phoebe bird" indicate that the chickadees have been guilty of ventriloquizing; now and then a hawk is seen, or perchance an owl.

The boys capture their first crayfishes (known to them as "crabs"); perhaps a venturesome green snake or garter snake is seen; rain brings the season's first earthworms to the sidewalk. A stray fly or ant indoors surmises that spring is at hand. The dog and the horse shed a surprisingly quantity of hair.

The grass in favored nooks hints of returning green. The gardener constructs his hotbed out-of-doors, while indoors, in "flats" on the window sill, he sows the seed of flowers and early vegetables that are to be transplanted. Nursery and seed catalogues do frequent service.

Second Week—

Snow disappearing; perhaps uncomfortably warm, followed by raw weather or heavy snow fall; trees likely to be coated with ice or hoar frost, making a fairy landscape. High water in the creek.

The first song sparrow and the first bronzed grackle (crow blackbird). Robins and meadow larks abundant; small flocks of bluebirds are seen. The noisy crows seem to have important matters on hand. The whistle of the horned lark still sounds in the fields. An occasional tree sparrow on the tree-top while the gregarious snowbirds (junco) flit beneath. Wild geese rest upon the breaking ice of the lake.

Chicken fanciers are busy with incubators and brooders; perhaps in some localities there may be discovered an old-fashioned setting hen.

Of the trees, the sugar maple is the favorite at this season.

The days are appreciably longer. Seeds are sown in hotbed. A garden plan is drawn. Sweet peas are planted and trees are pruned.

Third Week—

The winter overcoat is shed—temporarily. Thunderstorms are succeeded by cold waves. The ambitious grass fares poorly in its attempt to observe St. Patrick's Day.

Soft maple, elms, box elder and horse chestnut buds swollen; in some years the soft maple and perhaps the American elm show early bloom. Lilac buds often open. Premature dande-

lions, chickweed, spring beauty and Isopyrum, two or three weeks ahead of time, may possibly be found in bloom by persistent searchers. Snowdrop and crocus in bloom in yard or garden.

Slugs appear on sidewalk; a stray giant water bug may be captured. As the frost leaves the ground (in early seasons) frogs may be heard croaking, and salamanders or earthworms seen.

The vernal equinox attracts us into astronomical fields.

The thrill of the redwinged blackbird is a new and welcome note in birdom.

Fourth Week—

The weather is "fitty"; the sun's smile serves only to remind us that snow and wind are in reserve. However, spring gains many recruits this week.

New bird arrivals are the fox sparrow, kildeer, kingfisher and phoebe. Robins, juncos, golden-crowned kinglets and chickadees are still gregarious. Bluebird and redheaded woodpecker nesting; flicker and phoebe abundant; white-breasted nuthatches seen in pairs; possibly an early morning dove.

Soft maple and American (white) elm break into bloom, and perhaps the slippery (red) elm joins these before April arrives. Leaf buds of lilac, box elder and wild gooseberry open.

Pasque flower blossoms; now and then a dandelion or shepherd's purse; transplanted in the wild flower garden, the hepatica or rue anemone may be in early bloom. Lilies and bleeding hearts in the garden and catnip, cinquefoil and other herbs of the field show rapidly growing foliage.

Occasional insects flying; crayfish mating.

The lawn is to be raked, fertilized and rolled.

* * * *

Reviewing now these weekly summaries to obtain suggestions for topics for nature lessons, we whiff the air of the out-of-doors. Though the weather is fickle, there are many days that coax us into the open while Dame Nature is still rubbing her eyes and before she is fully awakened.

Of all the March happenings that which most appeals to us is the arrival of the leaders in the great northward movement of the birds. Meteorological observations are opportune, and of especial interest in connection with migration data. The sorry movements of the rudely awakened housefly suggest the problems of the winter and spring as they present themselves to insects.

Interest in the window box, the hotbed and the selection of garden seed is timely. The lawn deserves attention and trees should be pruned. The first of the trees unwrap their buds, and the earliest of the spring flowers appear. A few hardy insects emerge from winter quarters. The dog and the horse are shedding their cold weather coats. On all sides we detect "signs of spring."

To summarize, we select out from our March nature notes the following subjects for investigation:

Migration of birds
Awakening of hibernating animals
Spring changes in animal coverings
Poultry raising
Opening of winter buds
Pruning of trees; the selection of trees and shrubbery
Rapid growth of the first appearing herbs
Maple sugar and the sugar maple
Care of the lawn
Window box, hotbed and cold frame
The choice of seed; planning the garden
Weather studies and astronomical observations

MARCH BLOSSOMS
TWIG OF AMERICAN ELM

SOME OBSERVATIONS ON HIGH SCHOOL AGRICULTURE

By LEROY ANDERSON, Professsor of Agricultural Practice and Supt. of Farm Schools
College of Agriculture, Berkeley, Calif.

My trip East last winter was more particularly to visit secondary schools of agriculture established in connection with colleges or as separate institutions. Where time was available, however, I made it a point to visit high schools which were teaching agriculture and especially to talk with those who are leading in the development of industrial education. The Middle West has especially strong advocates for the two chief methods of teaching agriculture in institutions below the college, one favoring the special agricultural school, the other favoring teaching the subject in the regular high school. The advocates of the special school make rather strong objections to its introduction in the regular school system on these grounds,—first, the atmosphere of the high school is all wrong, it is too academic, since its first use is and has been to fit for university;—second, the students we want to reach are not in the high school and will not go to the high school;—third, the high school can never hope to have sufficient equipment to teach agriculture in such a complete and dignified manner as will command the respect of the farming community.

All of these statements may have been true at some time, all of them may be true in some localities now, some of them are true in some localities now. The special agricultural schools have had twenty years to prove their worth and their capacity. Agriculture has not been tried for a sufficient period in established high schools to warrant such sweeping charges save as prophecies. That these objections are not serious is evidenced by the unanimity with which several states are undertaking the introduction of agriculture into their high school system. It is too early, of course, to give examples of success based upon much experience, but thus far there has been no reaction from the enthusiastic beginning. A few illustrations will show the trend of the matter.

In 1908 the New York legislature made provision for the introduction of agriculture, and other industrial subjects, into the schools of the state. The appropriation allowed $500 for one teacher engaged in such subjects, and $200 for each additional teacher. A year later six or eight high schools were teaching agriculture and I was informed by those who knew that forty or fifty more would be doing so if men could be found as teachers.

New York will be remembered as a state which has already established three special schools of agriculture. The same year the Virginia legislature made an appropriation of $20,000 to be divided equally amongst ten high schools which should be selected in the different congressional districts for the introduction of agriculture and household arts. I had the pleasure of visiting the school at Manassas, Virginia, which was beginning under about as unfavorable and crude conditions as could be looked for. The teacher was a live man and with only a year of work had interested the farming community to the extent of forming a farmers' institute which held monthly meetings and had resulted in rallying the community to the support of the school.

Minnesota, which would naturally be considered the stronghold of the special school of agriculture, in 1909 made an appropriation for teaching industrial subjects including agriculture in the regular high schools. The law provides that not more than ten schools could receive state aid the first year and the appropriation to each school should not exceed $2500 per year or two-thirds of the total paid for teaching such subjects. The law also provided that not more than ten schools could be added each two years thereafter; that trained teachers must be employed and that each school must have at least five acres of land for garden and experimental work.

Michigan began teaching Agriculture in the high schools in a definite way in the fall of 1908. This was done, I believe, without a special state appropriation. The North Adams School board in 1908 requested the college of agriculture to outline a course for their school. The request was complied with and the following fall one of the college graduates sent there to teach. Last year six of the high schools were giving agricultural instruction and more were clamoring for teachers.

California began very much as Michigan. No special appropriation has been made for the introduction of agriculture, but during the year of 1909-10 five of our high schools were supplied with agricultural graduates. These five were Fresno, Oxnard, Bakersfield, Imperial and Gardena. The present year, beginning September 1910, there are eleven agricultural graduates in high schools who are teaching that subject. The additional towns are Livermore, Salinas, Stockton, Hollywood, Brawley, Azusa and Ferndale. The people of the different localities are grasping the situation with a great deal of enthusiasm and giving their schools splendid support. Gardena, which is part of the

Los Angeles city school system, but in the suburbs, has been provided with fourteen acres of land which was purchased by the city at cost of $1000 per acre. This is being put under irrigation and is laid out for the various cereal and fruit cultures which are common in that section. At Bakersfield is the Kern County High School. During the past summer the board of supervisors purchased for the school 24 acres of land at a cost of $16,000. This was formerly used for fair purposes by an agricultural association. The agricultural teacher of the high school is occupying the house on the farm and is laying it out with the idea of establishing a dairy of ten or twelve cows, with alfalfa and corn as the chief forage crops. He will also do considerable experimental work with cereals, especially barley. The section is one that promises to develop chiefly along the lines of dairying and grain growing, and a demonstration farm properly conducted will be of immeasurable value to the county. Others of California high schools have various areas of land for their use, but these instances suffice to show the trend of matters with agriculture as a high school subject in this state.

The beginnings of the several states mentioned show at least strong evidences of hope that the schools may meet the needs of agricultural communities. It is too early yet to form an opinion based upon actual experiences, but the outlook is exceedingly bright.

The COMMITEE OF ONE HUNDRED ON NATIONAL HEALTH, of the American Association for the Advancement of Science, has voted to abolish dues in the American Health League, but is now appealing for funds to push the campaign for a National Department of Health. The league was organized (1st) to induce the newspapers and magazines to provide health literature; (2nd) to start the insurance companies in a movement to prolong human life; (3rd) to induce Congress to establish a Department of Health. The first two purposes have been accomplished, and the third purpose can be accomplished, it is believed, if the proper effort is made. Contributions are to be sent to the Secretary, Drawer 45, New Haven, Connecticut, but checks should be made payable to the Title Guarantee and Trust Company, Treasurer, New York City.

AN EPITOME OF MY CREED ON THE TEACHING OF NATURE-STUDY

By ELLIOT R. DOWNING, State Normal School, Marquette, Mich.

AIMS	THE MATERIAL—its selection and arrangement in a *course of study*	METHODS
A.—Individual		
I. Spiritual		
(1) Moral—1. To stimulate a love of Nature.	Such objects as will stimulate the moral sense and lead to a companionship with Nature.	Constant field work to cultivate joy in God's Out-of-doors.
2. To put into commonplace objects a spiritual significance.		Memorize good nature poetry or prose—that full of spiritual interpretation.
(2) Esthetic—To cultivate a sensitiveness to the "beauty everywhere revealed".	The beautiful things—not the gaudy.	Study the great nature pictures.
		Cultivate artistic expression, drawing, water color work, etc.
(3) Intellectual—1. To drill in the *complete* inductive thought process. Beginning with the *fundamental observation* — the stimulation of all the senses—and leading up through the successive steps to *reasoning* and the final *judgment*.	Such material as will lend itself to problem form.	Use experiments sparingly in the lower grades. Reason develops at a later age.
	Commonplace objects so each child may have a specimen in hand.	Make sure that each child has ample chance to observe.
	Material interesting to the child. Remember interest changes with age.	Devise interesting approach to each topic.
	The subject matter of nature study, to have largest value in intellectual drill and the creation of thought power, must also have, as the classical course has, (a) dependent continuity. (b) increasing complexity commensurate with the growing powers of the child. (c) consequent unity. This is best achieved by organizing the course on the basis of a dominant concept such as EVOLUTION.	Get out-of-doors for complete sensory training.
		Do not teach evolution in the grades. That or any other basal idea is the hidden thread on which the lessons are strung and unified.
2. To reveal the meaning of the child's ordinary surroundings.		
II. Physical—Recreation		
B.—Social.—To furnish such data as will make for greater social efficiency.	Material that may make for increased social efficiency. The modern school course must needs aim to provide a culture equivalent to the old classical course, yet acquired on material that has a distinct wage-earning value: this with the least expenditure of time and energy.	

INSTINCT OR INTELLIGENCE?

By JOHN THOMA SON, Student in Sam Houston State Normal, Huntsville, Texas

(Manuscript submitted by Prof. Carl Hartman, Dept. of Botany, Sam Houston State Normal.)

While hunting near Galveston Bay, in the winter of 1908, I crippled a large Canada goose and was able to capture him alive. Under proper care, his injured wing soon healed. Later in the season I took him to a pond in the marsh and set him out with a number of wooden goose decoys, hoping to get some geese.

The day was ideal, and as we were in the line of the birds' flight from the bay to their feeding grounds, it was not long before a flock of Canada geese came in sight, and immediately the lonesome gander among the decoys began to call his wild kindred down, splashing and flapping about in the water in his eagerness. Without any fear or hesitation, the flock circled in, and as they hovered in front of our blind, we fired, killing several. After the diminished flock had flown out of sight and the dead birds had been retrieved, the captive, after calling a little, quietly resumed his feeding. Later another flock came over, and the same thing happened, the geese coming fearlessly down to the decoys. So it was with the next flock, but when for the fourth time one of the long flying wedges drew near, the captive goose did not call at first, although it was plain that he saw his kindred. He swam restlessly back and forth, eyeing the flock, which, alarmed at his behavior, circled the pond at a safe distance, then looking askance in the direction of the blind. Finally his loneliness seemed to overcome his fear, and at his invitation, the flock sailed down, to be received like their predecessors.

Finally, when at sunset a fifth flock came honking musically over the marsh, flying low and in our direction, there came the surprise.

It was late, almost dark, and the geese sighting our decoys, came straight for us. The big gander eyed them in sullen silence. They made a preliminary circle or two, out of range, and then, with wings set, came slanting down wind toward the stools. An instant they would be in gunshot—when, suddenly, the decoy, raising himself high upon the water, screamed the unmistakable danger signal of his kind! At once the orderly array of geese was in confusion, and climbing straight up, high out of gunshot, they were soon out of sight and hearing, leaving behind the astonished hunters and the lonely captive.

Does not the above account show a glimmer of reason on the part of the goose?

CURRANT CUTTINGS

By FRANK K. BALTHIS, Superintendent of Grounds, Northern Illinois State Normal School, DeKalb, Ill.

The accompanying illustration is a lesson in itself. It teaches us one step in the preparation of currant cuttings for propagation. Currants root easily from cutttings made from well ripened shoots of one year's growth. They are usually taken about September 1. Strip off the leaves and make cuts six to eight inches long. Make a clean straight cut just beneath a bud to form the base; the top may be cut on the slant above the upper bud. After cutting, tie in bundles of about twenty-five and bury out-of-doors. Turn the butts up and cover with two to three inches of soil. They should be given additional covering at the approach of winter. By spring a callus will have formed; occasionally roots will appear as shown in the picture. Very early in the spring the cuttings should be taken up and planted. Planting should not be delayed, as currants make their growth in cool weather.

NATURE-STUDY NEWS

The Chicago Nature-Study Club (section of the A. N. S. S.) held a unique first meeting for 1911 in the form of a "Good-Fellowship Luncheon" to members and friends, in Mandel's Ivy Room, Saturday, February 11, at one o'clock. Plates were seventy-five cents. There were seventy-five present. The program following the luncheon consisted of a number of two-minute talks on the topic, "How Can the Club Be More Serviceable to Its Members?" Everyone was enthused and the section hopes to accomplish much this year. Praise was given to the Nature-Study Review.

Action was taken to make the luncheon an annual affair.

Emily C. Westberg, Secretary-Treasurer.

The St. Louis Section of the American Nature-Study Society held an indoor meet on March 3, 1911, 4:15 P. M., in the Assembly Room of the Central High School. An illustrated lecture on "The Birds, Our Creditors," was given by Fred L. Charles, secretary-editor of the A.N.-S.S., to an audience of fifteen hundred people. All teachers and friends were invited to this meeting. On Saturday morning, March 4, Mr. Charles addressed the Society of Pedagogy, of St. Louis, on the topic, "Children's Pets". The lecture was illustrated by colored stereopticon views.

The Agassiz Association (E. F. Bigelow, president, Arcadia, Sound Beach, Conn.) has issued a special appeal for financial aid. The organization is of long standing and represents a most worthy cause. It publishes "The Guide to Nature".

Recent press reports state that the Ohio Legislature has passed a bill making compulsory the teaching of agriculture in rural schools.

Prof. Otis W. Caldwell, of the University of Chicago, is on an extended lecture tour and vacation trip through the Southwest.

The Illinois Federation For Rural Life Progress was organized at Bloomington, Ill., February 13, 1911. The meeting was attended by a large number of men and women representing a variety of organizations, including school, church, press,

farmers' institute, household science association, the Grange, W. C. T. U., and W. M. C. A. Much enthusiasm was manifested, the moving spirit being Miss Mabel Carney, formerly of the West State Normal School, Macomb, Ill., and now of the State Normal School, Cheney, Washington. A constitution was adopted and officers elected, Mr. J. B. Burrows, of Decatur, Ill., being chosen president. The plan provides for an advisory council, an executive committee and a country life commission. The first regular meeting is to be held at Normal, Ill., July 14-15.

At the annual meeting of the SOUTHERN CALIFORNIA TEACHERS' ASSOCIATION, held at Los Angeles, the Agricultural Education Section had as one number on its program the "Presentation of the Work and Claims of the American Nature-Study Society."

PROF. C. F. HODGE, of Clark University, lectured recently before the Southern Minnesota's Teachers' Association.

PROF. E. B. BABCOCK, of the University of California, who was recently chosen director on the council of the A.N.-S.S., is at present visiting educational institutions throughout the East and South.

MR. D. LANGE, Principal of the Humboldt High School, St. Paul, Minnesota, well known as author of "Handbook of Nature-Study," is taking an active part in the promotion of the "Boy Scout" movement in that city, serving as chairman of the Instruction Committee. Several thousand boys are being reached, the chief effort being in the nature-study field. The topics for the weekly evening meetings (held at the Commercial Club) are as follows:

February 7—Boy Scouts attend lecture by Mr. Banes, secretary of the American Bison Society

February 14—Camp Equipment

February 21—Scout Signals and Building of Bird Houses

March 7—Measuring Distance and Sketching Local Territory

March 14—Telling Direction by the Stars

March 21—How to Forecast the Weather

March 28—How to Know Our Transient Bird Visitors

April 4—Rocks and Lakes Around St. Paul

April 18—How a Scout May Raise Chickens and Make a Garden

April 25—Fish a Scout Should Know

May 2—Wild Animals a Scout Should Know

May 9—Summer Birds a Scout Ought to Know

May 16—How a Scout Can Raise Bees

May 23—Farewell meeting for season and talk on conduct and observations during summer vacation

The CALIFORNIA SECTION of the A.N.-S.S. has elected Professor V. L. Kellogg, of Leland Stanford Junior University, as its director and representative on the council of the society.

A SPECIAL EDUCATIONAL TROLLEY TRAIN IN THE INTERESTS OF RURAL SCHOOLS, equipped and provided with speakers from the College of Agriculture of the University of Illinois, was run over the lines of the Illinois Traction System, February 27 to March 10, 1911. One day was given each town visited. Simple talks with well selected illustrative material were given on the subjects of poultry, farm animals, soils and crops, the dairy, and birds and insects. The train consisted of two cars and carried representatives of different types of poultry, models of houses, brooders, incubators, feeds, feed boxes, and trap nests, a live sheep, cuts of meat, types of soil, pot cultures showing crops grown under varying conditions of plant food, exhibits showing component parts of milk, milk utensils, methods of detecting "robber cows," composition of seeds, life histories of injurious insects, colored charts of birds, etc.

The county superintendent of schools acted as host through his county. At most of the stops overflow meetings were necessary, and talks were given in waiting rooms, school houses, warehouses, halls, churches, and frequently in the open field. A daily average of thirteen hundred people, almost wholly children, visited this novel train, which was characterized by some as "a little college on wheels". In several instances schools closed and children, teachers and directors drove in on hayracks or other vehicles a distance of six or even ten miles.

The interest in nature-study-agriculture was most gratifying, and there was abundant evidence that this subject is rapidly winning its way into the schools.

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THE
NATURE-STUDY REVIEW
DEVOTED PRIMARILY TO ALL SCIENTIFIC STUDIES OF NATURE IN ELEMENTARY SCHOOLS
VOL. 7 APRIL, 1911 NO. 4

A BASIS OF ORGANIZATION OF THE COURSE IN NATURE-STUDY

By OTIS W. CALDWELL, University of Chicago

Nearly all of those who take elementary science seriously at all, are convinced that it must be organized fairly definitely in so far as concerns purposes and the general line of procedure. There may be wide variations in the field covered due to adaptability and appropriateness of materials in different localities. But if our study of children and of the purposes that may be met through elementary science are not at fault, that study should furnish us guiding principles by means of which something may be done in organization of a coherent course. Any course is more or less tentative, and must undergo modification in response to additional interests that are concerned in the problem.

People are not entirely agreed as to what are the major purposes of nature-study but the following doubtless will serve as a sort of clearing-house statement of some of the purposes. There are inherent interests in nature which compel an attitude of inquiry in most normal children. This attitude of inquiry may be fostered, stimulated, and directed to the end that knowledge of nature may be developed through use of the senses and powers of interpretation. Also, the senses are quickened and made more reliable, and more ready and more accurate interpretation may be made so that more difficult problems may be undertaken with greater independence. It is also recognized that concrete experience with nature contributes knowledge that is of constant use. Natural phenomena are abundant in children's environment, and as they walk afield, talk with a friend, read a book or newspaper, or think of any phase of the world's work, they are enriched constantly by use of concrete contact with nature, or impoverished by its absence. The illustrations of their conversation, of the literature which they read, and of the industries about them constantly demand nature knowledge, and their enjoyment of these is in proportion to the effective contact they have already enjoyed with nature. Additionally, we must recognize as prominent among purposes the control of nature that comes through dependable nature knowledge. For example, the currant crop may fail through the ravages of caterpillars. Had there been knowledge of cater-

pillars, the butterfly eggs and chrysalis, and of means of elimination or preventing the growth of caterpillars, there might have been more currants. Thousands of other illustrations attest the increased ease and efficiency of living that comes to people through reliable nature knowledge. Much of this knowledge is of the extremely elementary kind which our forefathers got in daily life in course of their struggle for existence amid a superabundance of natural obstacles. There are in our modern civilizaation critical periods when such knowledge is quite as useful as ever, but our more complex environments are less likely to develop such knowledge unless definite attention is directed to its use. Enjoyment of nature is likely to accompany and follow any interesting, stimulating and useful study. We cannot secure genuine enjoyment unless we seek a more fundamental purpose than *mere* enjoyment. It accompanies and is enlarged through a purposeful and dignified consideration of the facts and processes of nature. Real enjoyment, even to youngest children, comes through doing something which according to the age and advancement of the learners seems dignified. Study of appropriate difficulty and usefulness is essential to enjoyment.

In organizing a course, the native interest of children should be considered, not that interest is an all-determining factor, but it is important and should be utilized. From experience and the data now at hand it seems safe so say that children of the grades, with reference to interest in nature, may be classified into three groups. These groups are not definitely determined and it is not easy to establish a dividing line between them. In a general way, however, the kindergarten, first and second grades constitute one group; the third, fourth and fifth grades, the second group; and the sixth, seventh and eighth, the third group. The first group is characterized by that which I have termed the "What?" attitude of mind. It is a period of identification of natural objects. Young children want to know the names of things, to have a speaking acquaintance with their environment. It is a period of orientation, not of interpretation. The common trees, the hills, valleys, streams, the kinds of common rocks, both in form and qualities, the common animals, including birds, the nature materials of the market and home, are some of the things with which young children like to become better acquainted. Children's interests and their ability to make interpretations limit us to acquaintanceship work in this period. As illustration, one group of second grade children learned with great avidity and searched diligently for several days in enlarging their acquaintance with kinds and forms

of stones. They called them by name and classified them first with reference to form, then with reference to hardness, etc. On the beach the fact of rolling and wearing interested all, but explanations about general processes of wearing rocks were futile. In this first group interests are as wide as the environment and are based upon desire for acquaintance with the different things in the environment. Consequently, in so far as interest may be used in developing intellectual activity it would suggest the selection of a wide range of materials, and an acquaintanceship use of all of them.

In the second group there is still interest in extending acquaintance with nature, but "What?" is now supplemented by "How?" The processes of wearing of stones in ripples and along beaches becomes a topic of intensive study, as well as does relative hardness of rocks as determined by simple experiments. The name of toad and cabbage butterfly is the starting point for interest and investigation of the almost miraculous life-round. Acquaintance with garden plants leads logically into interesting experimentation and study of how they live, rate of growth, method of seeding, relation to soil and water, etc. This is a period of more intensive and prolonged study of a smaller number of topics.

In the third group, what things are and how processes are carried on are still important, indeed are never lost, but there is the added interest relating to utility in its broadest sense. The subjective focus of attention makes the sixth grade or thereabouts the proper place for definite considerations of hygiene—individual, group, school and community. Previous experiences with plants and animals and some of the conditions under which they may thrive, previous observation of physical facts are now most appropiately turned upon the study of proper efficiency of the human body. The study is built upon previously acquired nature knowledge and is made in the beginning of the adolescent period, thus coming at a time when it should be most potent. It is, of course, understood that admonition relative to personal habits will have followed through all preceding school work, but this year of hygiene is outlined to rationalize present practices and form the basis for new ones, and comes at the proper period for definite study of these matters.

In the upper grades, usually the seventh and eighth, interest centers in a still more intensive study and in a smaller number of topics as related to the elementary principles of science and to utilization of nature in the home and community. The accumula-

tion, organization and coherence of a group of facts about a single topic or problem is now most important. The topic or problem in which interest lies or may be aimed is often one of the home, or school, farm, or neighboring industry. Electrical phenomena and appliances are universally interesting and may be made universally educative, as well as the elementary principles of machines, heat and cold and their applications, the history, domestication and utilization of farm and forest plants and animals, and study of their natural enemies. In short, the elementary science of home, farm, industry and community are now matters of greatest nature interest. Obviously not many topics may be used in these upper grades, but those used should be studied experimentally and observationally to the end that accuracy and care in study and interpretation may be developed. The particular topic studied should be determined by the local interests and possibilities, but the point of view and ends to be secured are general.

In this skeletal outline of the bases of organization of the course, it perhaps needs to be said that the dominant feature of each group of pupils has been emphasized, but that all these interests are found in some degree in each group. If these are dominant, however, it seems clear that we should recognize them as at least prominent factors in determining procedure in study of nature. They will help greatly to unify and give more definite purpose to our rather diversified practices.

The teachers of Hamilton, Ohio, who are interested in nature-study met at the Central High School assembly room, Monday, March 27, for the purpose of taking preliminary steps toward organizing a local branch of the American Nature-Study Society. About twenty-five were present and most of them signified their intention to become members of the Society. The meeting was addressed by B. M. Davis, president of the A.N.-S.S.

The properly prepared rural teacher is expected to be able to organize the school, to harmonize the board, to socialize the community, to vitalize the course of study, to ruralize the city children, to urbanize the country children, to Americanize the foreigner, to spiritualize the girls, to civilize the boys, to agriculturalize them all, and to immortalize herself.

—*Mertis B. Whitaker,*
President Ill. Country Teachers' Association.

STUDIES OF AQUATIC INSECTS

By L. S. HAWKINS, Cortland Normal School, Cortland, N. Y.

Ponds and brooks may furnish valuable material for nature-study lessons, ranging from those insects which attract attention merely on account of their interesting habits to those which are of vital economic importance on account of the part which they play in man's life, for good or ill.

Many of these insects come to the surface to breathe, so that no provision need be made for plants to furnish oxygen. For others, plants must be provided or the water must be changed occasionally.

These insects may be kept for a week without feeding, and if it is desired to keep them longer they may be fed once a week with a bit of raw meat fastened to a string, so that the uneaten portions may be removed.

These insects may be collected by sweeping with a net the plants growing around the edge of the pond. In place of the net, one may use a handled strainer with wire on the bottom, such as is found in the kitchen.

The lessons may well be correlated with art and English as suggested in the following outline lessons. The first lesson should be occupied with a study of the insects. Following this may be the drawing lessons, and then the literature bearing on the subject may be studied.

Primary Grades

(Fall or Spring)

Problem

How do insects live on the surface of water?

Materials

Water strider, whirligig beetle, glass dish.

Method

No water plants are needed for these insects. They may be fed on flies or raw meat. The observations should be allowed to extend through several weeks, and a few questions may be asked at a time, or written on the board, so as to guide the children's observations, many of which may be made outside of the lesson period.

Observations

1. How do they float?

What part of each insect touches the water? How does the surface of the water look where a foot touches it? Place the

dish in the sunlight and observe the shadow. What is the appearance of the shadow of the tip of the foot? Carefully drop a dry needle on the surface of the water till you can make it float. How does the surface next to the needle look? Is it like the appearance of the water next to the strider's foot? See if you can make a wet needle float.

2. How do they move?

How does the strider move? Do all its legs touch the water? Does the beetle move in the same way? Does either insect leave the surface of the water? Does either go below the surface? How does the beetle move when under the water? Can you see how it secures any air to breathe? Do you see how these insects might secure their food?

What are the chief differences between the insects as regards appearance and habits? Which do you think the more interesting insect? Why?

Are there any other things you would like to observe or learn about these insects?

Watch the streams and ponds in the neighborhood and notice on which ones you find these insects.

Drawings

Make drawings of the strider when at rest looked at from above. Beside it make a drawing of a floating needle.

Make drawing of beetle at rest as seen from above. Make drawing as seen below the water, showing the bubble of air on tip of abdomen.

References (for teacher)

Miller's "The Brook Book"; Comstock's "Insect Life".

Intermediate Grades
(Fall or Spring)

Problem

How are certain insects fitted for living in the water?

Materials

Glass receptacles, some of the following insects: Water boatman, back-swimmer, giant water bug, water beetles, caddice worms. For the caddice worms the water must be changed occasionally or else water plants must be provided. The other insects need no special provision. The case-building caddice worm may be found under stones in stream and ponds. It should be studied in the spring so that its transformation may be followed.

The net-building caddice worm may be found attached to stones in running water of brooks or attached to dams. This can not be kept for more than a day or two in the ordinary aquarium and so is best studied in the field.

Method

The insects should be kept for several weeks so as to allow sufficient opportunity for the children to study their habits. They may be fed once a week on raw meat or mosquito larvae. The children should be encouraged to observe at odd moments out of school hours, as well as during the lesson period. To guide the children's study, the following questions may be written on the board, a few at a time.

Observations

Study each insect with reference to the following points:

1. How does it move?

Does it have more than one method of moving? How are its legs fitted for swimming? Is its motion rapid or slow? Is the shape of the body such as to help or hinder its motion? Does it ever leave the water or attempt to fly? Which insect seems best fitted to rapid motion?

2. How does it breathe?

Does it ever come to the surface of the water? What is its position when at rest? How does it secure air? Which can stay at the bottom the longest? Why do caddice worms need to move less than the backswimmers?

3. How does it get its food?

What kind of food is taken? How is it secured?

4. How is it protected?

How are its wings protected from injury? How is it protected from its enemies? Which insect seems best protected?

5. What are the important differences between the backswimmer and some land insect such as the grasshopper? Suppose they should change places?

What do you consider the most interesting things you have observed about these insects?

Drawings

Make drawings of the insects while at rest.

Literature (for children)

Lovejoy's "Poetry of the Seasons", pages 37 and 125.

References (for teacher)

Miller's "The Brook Book"; Comstock's "Insect Life".

Grammar Grades

(Mosquito in either fall or spring; dragon fly in spring)

Problem

How may mosquitoes be destroyed?

Materials

Tumblers or other glass dishes, mosquito netting, eggs, larvae and pupae of mosquito, kerosene, goldfish, tadpole, various water insects.

Method

The larvae and pupae should be kept in dishes covered with netting to prevent the escape of the adults. The water stages should be kept till they undergo their transformations, which usually takes less than two weeks. When the adults emerge they may be kept in the tumblers and studied. A few larvae and pupae should be kept in separate tumblers so that the time spent in each of these stages may be observed. If pans of water are left outdoors, frequently eggs will be laid on the water.

Observations

What must we learn about the mosquito to be able to solve our problem?

1. The egg. Where are the eggs found? How does their shape enable them to float? Are they laid singly or in masses? How long before they hatch?

2. The larva. As it increases in size, through what changes does it pass? What is its position when at rest? How does it secure air? When disturbed, what does it do? Time one to see how long it remains at the bottom. How many days from the hatching of the egg till the larva goes into the pupal stage?

3. The pupa. How does the pupa differ from the larva in position when at rest and in the location and number of breathing tubes? How long does it remain in the pupal state? How long does it take to develop from the egg to the adult?

4. The adult. The male and female differ in appearance. Look at the antennae and palps and determine what the difference is. Place a piece of wood on the water for the insect to rest on. Note the position of the legs and head when resting. Note the number, shape and character of the wings. Describe the mouth parts. If one of these mosquitoes stung you, could it give you malaria? Explain. Find out what you can about the relation of mosquitoes to malaria.

If the common and malarial mosquito can both be obtained,

compare them in each stage as regards appearance and time required for development.

Experiments in Destroying the Mosquito

Place a counted number of larvae and pupae in a jar with a fish. Observe at periods for day or two.

In another dish place a tadpole with some larvae. Watch for results.

Test various kind of water insects. Count the number of larvae used and note how many are eaten in a certain length of time.

In another tumbler containing larvae, pupae and adults, pour a few drops of kerosene on the surface of the water and note results.

Which do you consider to be the most important means of destroying the mosquito? Why? What are the most important things to know about their life history in order to destroy them by artificial means?

Search the neighborhood to find the breeding places of mosquitoes and see what can be done to lessen the number of these places and to destroy the mosquitoes while breeding. Make a map of the surrounding country showing the location of these breeding places.

Drawings

Make drawings showing the larva, pupa and adult in their resting positions.

Literature (for children)

Bryant's "To a Mosquito"; Pierson's "Among the Night Folk", page 15.

References (for teacher)

Comstock's "Insect Life"; Hodge's "Nature-Study and Life".

The Dragon Fly

(Spring)

Problem

Is the dragon fly beneficial or injurious to man?

Materials

Nymph of dragon fly, some receptacle for keeping nymph.

Method

The nymphs may be collected in April and May by means of a water net, or a garden rake by raking up the trash found on the edge of the pool. These should be kept in the schoolroom in

a glass dish or a small wooden pail. Either water plants must be provided, or the water must be changed occasionally. The nymphs may be fed weekly on raw meat or water insects. A stick should be placed upright in the water for the insect to crawl up on when it undergoes its transformation.

Observations

1. What is the nymph's food?

Place some larvae and pupae of the mosquito in the dish with the nymph and note whether they are eaten. How does the nymph catch its food? What is the position of its jaw when not in use?

2. How does it move?

Does the nymph come to the surface? How can it breathe? What means of locomotion has it? To see how the animal moves, take it out and place it in a tumbler containing a little water. Place a drop of ink near the tip of the abdomen. Watch each morning for the transformation into the adult.

Place the adult in a cage together with a tumbler of water containing mosquito wigglers. When these have passed into the adult state, note whether they are eaten by the dragon fly.

Is the dragon fly able to sting a human being? Can you explain the origin of the name "darning needle", and of the idea that it is dangerous?

Drawings

Make drawings of the nymph as seen from above and also as seen from the side. Make drawing of the adult when at rest.

Literature (for children)

Lovejoy's "Nature in Verse", page 176; Rand's "Treasures of Canadian Verse", page 273; Daulton's "Wings and Stings", page 71; Tennyson's lines on the dragon fly.

References (for teacher)

Comstock's "Insect Life"; Needham's "Outdoor Studies"; Miller's "The Brook Book".

STUDYING THE ECHO

By JOHN T. TIMMONS, Cadiz, Ohio

[EDITOR'S NOTE: The author of this paper is deprived of sight, a fact which gives added interest to this article.]

Any of our young readers may spend an interesting afternoon or, better still, a few hours of the early morning, in the study of an echo. It will depend much upon the location of the student and the shape of the surrounding country. The best time to get good results is in the early morning, prior to a heavy rain or electrical storm. The atmosphere is heavier at this time and the echo seems to be louder and more easily located. If it is possible, the student should make his way to the country, and if the grass is wet with dew it will be best to follow the country road, for it is just as easy to find a hill or slight elevation off to one side of the road as it would be to discover suitable conditions if fields were traversed.

How are we to tell when we find an echo? That is very easy. Perhaps our lungs need exercise in the fresh morning air, and we can accomplish great good to ourselves by calling out in a loud, clear voice, either our own name, or the name of some friend, and if we hear it repeated away across the fields, or on some hillside, we will know we have found an echo. At certain times an echo at a given point is quite indistinct, while at other times it is very plain, and the words or any sound we see fit to make comes back almost as loud as the original. Words and short sentences should be used, for if we attempt to use long sentences we will hear only the last few words, and the experiment will not be satisfactory. A few clear notes on a flute or some other instrument produce good results, and a few words of a song are pleasing, as the tune as well as the words are reproduced. A gunshot is apt to stir up some wonderful echoes, but as such things are dangerous in the hands of our young friends, we would recommend the use of two blocks of wood, or the clapping of the hands, which will produce good results.

If we are fortunate in our search for suitable locations, we may find a spot where we may hear two or more echoes, coming from different points. It is best to keep in the valley or follow the hillside, and the surrounding elevations may be located so as to cause the soundwaves to be thrown back from different directions. Occasionally we will find a spot where the echo will pro-

duce another echo, and if we listen we might possible hear the third, produced from the first. There are places in the great hills and mountains where the echo is repeated until it seems to have wandered away over to the country miles away. In such places music or song of short duration produces the best results.

It may pay us to listen to the whistle of the locomotive as the train speeds along through the country. It very often produces a very pleasing echo. Such is often heard by passengers on the rear end of the train to which the locomotive is attached. There is an instance recorded where the echo of a locomotive whistle was so distinct from the opposite direction from the actual sound that a gentleman was misled by the sound and was run down and killed by the train.

It is interesting to watch cattle or dogs bawling or barking in answer to another supposed animal, when it is nothing but an echo.

Those who cannot go to the country may study the echo if they will but watch and listen. The shape and size of city buildings, and the width and angle of streets and alleys will very often produce some interesting echoes which are easily studied. A very good way to do in the city is to move about quietly, or remain at the open window, and listen for the echo from some sound produced by some one else. There will be plenty of sounds. The peculiar whir of an electric car as it approaches the corner is often reproduced on some building, making it seem as if the car was approaching from some other direction. The puffing of a locomotive as it moves through the railroad yards, or out along the track, often makes a very interesting echo, as it sounds as if there were several locomotives. The writer once knew a lad who called from his window to produce an echo, and in doing so he caused a neighbor boy to think he was making sport of him, and it resulted in a quarrel; and another who, calling his sister who was on the street, heard an echo, and thought it was some one mocking him, and he was ready for a fight.

In some localities the heavy rain clouds that sometimes pass over, leaving a calm, cool atmosphere, will send back an echo. This is caused by the weight and density of the rain cloud. Much of the rumbling of the thunder we hear during a storm is the echo of the first report produced by the great sound waves striking both the hills and heavy clouds. In many deep canons in the rugged mountains, and in some caves, the echo is something

wonderful. It is estimated that a single word or revolver-shot will be repeated hundreds, and in some places, thousands of times, producing a perfect bedlam of sounds.

The voice over the telephone and the reproduction of the voice on the phonograph are in one sense an echo. When the phonographic record is made, the sound wave causes a needle to vibrate and traverse the surface of the blank record plate, leaving very slight indentations. When the record is placed in the machine, and the needle is allowed to traverse these indentations at the same speed, the sounds are thrown off through the needle and made audible to the human ear by the magnifying qualities of the machine and its horn.

I believe it is possible to trace the echo in other ways than through sound. I believe good thoughts, kind deeds, and a loving heart produce echoes that are still more interesting than those produced by sound. Let us study them all.

COMMUNICATION

[Editor's Note: When the article on "Instinct or Intelligence?" was printed (in the March issue of the Review), it was anticipated—and hoped—that it would call out a reply. In no field of scientific study is caution more necessary. The editor is very glad to print the following comment.]

Editor Review:

I notice the question raised in the last number of the Nature-Study Review as to whether the goose refusing to give the call after three of four flocks had been fired into, might be credited to intelligence. I think it is much more rational to assume that the goose had been so much frightened by the first four experiences that the coming of the fifth flock aroused the instinct of fright rather than of greeting.

Very truly yours,

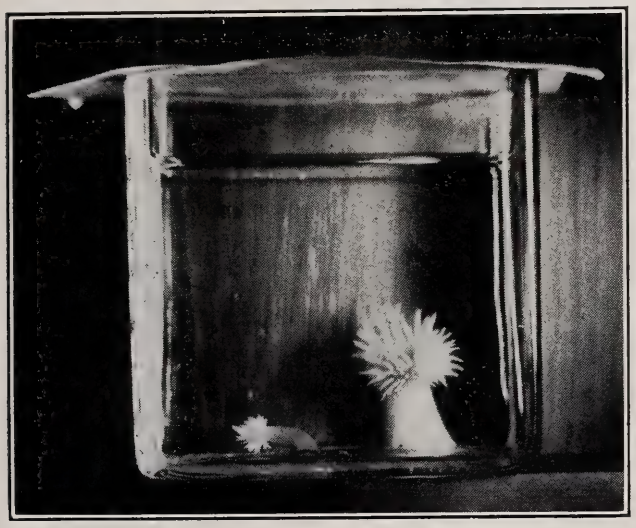
E. DAVENPORT.

A BIRD TRAGEDY

PHOTOGRAPHING WATER LIFE

By THOMAS I. MILLER, Brooklyn, N. Y.

The photographing of water life has always carried with it difficulties which have heretofore deterred the amateur from attempting this line of work. Many of the specimens need magnification and the difficulty of doing this and photographing them at the same time has resulted in leaving a fine field practically unworked.

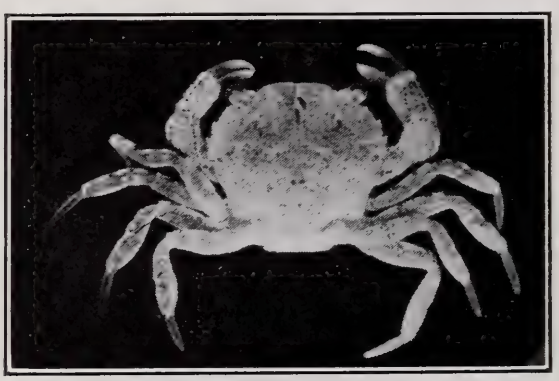


There is no apparatus on the market available for this work, but the inventive amateur can construct his own with very little expense. The advantage of photographing the specimens in water is readily seen when we realize the strained, contorted positions that water animals assume on being removed from their natural element. The sea anemones shown in the aquarium illustrate this, as well as the little crab which was also photographed through water in a shallow dish. This was enlarged as well.

In the construction of the apparatus, both the photography of large and small forms has been considered. The requirements of the work are as follows: A compound microscope with a good battery of objectives and eye-pieces; a suitable lamp for the illumination of objects; a camera with a ground glass focussing screen, a removable lens board and a bellows extension of about ten inches; and a photographic lens with focus of about four and one-half inches. A camera for five-by-seven plates is most suitable though one designed for four-by-five will give satisfactory results. As both opaque and transparent objects must be photographed and these at times immersed in water, the following apparatus covers both uses. With a few tools an efficient outfit may be constructed as follows:

For a baseboard take a piece of wood three feet three inches

in length by nine inches wide and one inch thick. Across the bottom on the under side of the board screw three battens, one at each end and one in the middle,—this to prevent warping. Now take a piece of wood two feet long and the same width as the baseboard, and with iron brackets twelve inches long fasten it to the baseboard in a vertical position as near to the end of the baseboard as possible. This will serve to hold the camera in an inverted position for use in taking photo-micrographs and also in the photography of large objects such as crabs and shells. Along the outer edges of the baseboard screw pieces of wood two feet long and one and one-half inches wide with upper edges projecting one-half inch above the baseboard. This will serve as a track in which a platform twelve inches long and about two and a half inches high may slide. This platform carries the camera and serves for taking photo-micrographs with the microscope in a horizontal position, and also for the photography of objects such as sea anemones in tanks which may be placed on a small shelf screwed on the vertical board. As in taking photo-micrographs the lens of the microscope replaces the camera lens, some arrangement must be made for this. The simplest way is to make a lens board which accurately fits the camera and in which a hole is bored which fits the tube of the microscope. In the sliding platform, bore a hole which will take the tripod screw to fasten the camera firmly to the platform. In the vertical board, bore holes which will take the tripod in an inverted position. After the apparatus is built, it should be painted well with a dull black paint.



The next thing is the standardizing of the apparatus. By trial with the photographic lens, see what position the camera must be in to make negatives one-quarter, one-half, three-quarters and full life size. With the microscope and camera, try out the various objectives and eyepieces and note the size of the circle when the object is accurately focussed on the ground glass. With the aid of small labels pasted on the baseboard and vertical board, the various camera positions may be indicated. Now typewrite the data on a sheet of thick paper and keep handy for reference.

It will be found that with a Zeiss objective for the microscope giving a power of four diameters, a field of one inch may be covered. This means that any object not larger than a twenty-five cent piece may be photographed with the microscope with excellent definition and depth of focus.

The proper illumination of opaque objects is a somewhat difficult problem. A suitable lamp may be easily constructed using a laboratory support and a Welshbach Junior mantle with a chimney made of brass tubing in which a slit is cut to allow the light to escape. This lamp can be raised, lowered or inclined. The proper connections with the gas supply are easily made. In general use, a large bull's eye condenser is placed close to the light source so as to obtain parallel rays which may be reflected back by small pieces of looking-glass inclined at an angle on the opposite side of the illumined object. This method avoids the too deep shadows which are a source of considerable trouble.

Of course it is understood that in photographing aquarium life in place, the flat sided tank should be used, not the one with rounding sides. Many forms of water life can not be satisfactorily preserved, hence the value of such permanent photographic records. The writer has photographed during the past winter such delicate things as the feathered feet of the barnacle, the egg capsules and eggs of many snails, as well as the various smaller sea anemones found on our shores.

THE BLUEBIRD

By FLORINE M. BECKHART, Aged 12, Five Mile Grove School, Cass Co., Iowa

The bluebirds are among the first to come in the spring and when we see the bit of blue flitting about we may be sure that grim Winter is making way for Miss Spring. As soon as the weather begins to turn warm they are hunting for a house to let.

A bluebird's dress is a rich blue color from the head to the tip of the tail. The throat and the upper parts of the breast are orange, but nearer the tail it is a dingy white. The male bird is a little darker than the female and both are about the size of an English sparrow.

I made the acquaintance of a pair of bluebirds that had taken an old hollow fence post for their home. May 10, when the nest was found, it had five pale blue eggs in it. The eggs were about the size of an English sparrow's. A few days later one of the eggs disappeared and I think the birds pushed it out because

some one touched it. The nest itself was made of dry grass, about three or four inches across and about the size of a small bowl.

The nest was much the same until the morning of May 23; When I paid my respects to the nest I found three little birds in it, and on the next morning the fourth egg had hatched. The little ones were almost naked except for a thin collar of black down around their necks and a little across their wings. They had the appearance of being all mouth, as their bills were wide and flat. All around the margin of their bills was a creamy rim. The inside was yellow. Almost every time the little birds heard anyone at the post they would open their mouths for something to eat, but as soon as they found that there was no food they would drop their heads and refuse to pay any more attention to the intruder.

The parent birds were very anxious when I approached the nest, and would fly around and over so close that I could hear the sharp clap of their wings.

The little birds grew so fast that by the time they were a week old they were almost twice the size they were at first. By the time they were two weeks old their pin feathers were showing and in the longest quills I could see a faint touch of blue. When they were three weeks old they were covered with feathers and could fly.

The female bluebird lays an egg every day and begins to incubate as soon as the first egg is laid. They rarely if ever sing while nesting.

Their enemies are cats, boys with sling-shots or rifles who are trying to see what they can hit, hawks, crows and English sparrows.

In Miss Schlundt's article on "A Year with the Katydids", in the March issue, the editor's note should have stated that the article was submitted by Mr. Henry F. A. Meier, Department of Biology, Evansville High School, Evansville, Indiana.

FARM CALENDAR

By O. D. CENTER, Supt. of Illinois State Farmers' Institute, Springfield, Ill.

(Continued from March number)

MAY 1-15

Do not become impatient to get the corn into the ground. Little is gained by planting before the soil is thoroughly warm. It is far better to give the land an extra thorough preparation which will kill the weed seedlings than it is to attempt to kill these seedlings after the corn is planted. If the seed has been thoroughly tested, plant only such amount as is best suited to the purpose to which you wish to put the crop. If you expect to use the corn for silage, it will be planted more thickly than if harvested for grain. If your soil is of fifty-bushel capacity or better, you can plant more thickly than if it is well worn. Follow the planter with the harrow, for much easier cultivation is accomplished with the harrow than with the cultivator and the harrow is just as effective.

Remember that the new grass which the stock is now getting contains less nutriment than the winter feed to which they have been accustomed. Better supplement the pastures.

MAY 15-30

If you have a clover field that has winter-killed or upon which there is a poor stand, do not think that this must go into corn. If it is in a rotation, do not fail to put some legume plant in the place of the clover. Soy beans make a splendid legume crop and are more easily to handle than cowpeas. If you put in the soy beans, it is well to plow the land and prepare as though corn were to be planted.

Provide sufficient pasturage for all the stock which you have. Remember that the stock suffer for lack of feed the same as you would suffer for lack of provisions. It may be that insufficient and poor quality of water is supplied to the pasture. Remedy this at once. Don't forget that the stock like access to salt as well as water.

The cultivator should be started on the corn and the potatoes, and the garden kept free from weeds.

The lawn will look better if the lawn mower is used regularly each week.

JUNE 1-15

The soy beans and cowpeas should be planted the early part of this month if they have not been before. Now is the time to keep the corn cultivators going steadily. A thorough cultivation while the corn is small is as good to eradicate weeds as two cultivations after both corn and weeds become large. Better see that the scythes and mower knives are well sharpened. The weeds along the fences will need prompt attention with the scythe. The mower should be examined to be sure it is in shape for use a little later. Don't attempt to cut hay this year with the sections of the mower knife bent or broken as you did last year. Sections cost little and even the boys will enjoy replacing broken and bent sections with new ones. The horses that you use on the mower will thank you for the change, too.

Better trim the hedges while the shoots are soft and young. You can trim five times as much in an hour now as you can a month later. The garden and lawn need your attention every few days. A few hours work will make both more attractive and the garden more productive.

That clover field that you intend to cut for seed should be clipped early. The alfalfa is demanding your attention and should not be neglected.

JUNE 15-30

In cutting the alfalfa and the clover plan to cure the alfalfa in the windrow with as little handling as possible. Handling breaks off many of the leaves and they are the most valuable part.

The potato field should be sprayed regularly with Bordeaux-Paris green mixture. Keep the cultivators busy every day in the corn, potatoes or soy beans. The garden, too, will be all the better for a careful cultivation every week. Don't hill up the potatoes or the corn or beans; plan this year to practice shallow, level cultivation.

As the weather becomes warmer remember that some sort of shade is grateful to all the stock and poultry. Remember, too, that as the days become hotter an abundant supply of good, clean, fresh water is more necessary than ever. Don't compel the stock to get their drink from a dirty, stagnant, green, slimy pond. How would you like to have to use that sort of a water supply?

Keep the work about the entire place up in hand. Early next month there is a holiday that all of you ought to observe.

EDITORIAL

Examination Questions for Nature-Study Teachers

In the existing order of things it is not surprising that prospective teachers in elementary schools should be asked to pass an examination in formal science rather than in nature-study. In fact, where nature-lore has been neglected in childhood, and where later instruction has been technical and non-environmental, it is more than likely that a physics text presents no greater difficulties than are inherent in a first class "bird calendar". There is a tendency on the part of examining officers to modify the long prevalent type of examination in botany, zoology, human physiology, and physics (for elementary teachers), injecting an element more suggestive of the field in which the applicant is to work. A set of questions from an examination recently given by a county superintendent of schools may be of interest here.

BOTANY

1. Define fungus, alga, pollen tube, Angiosperm, symbiosis.
2. Make sketches showing life history of a common mold.
3. Explain how "clover enriches the soil".
4. Discuss inter-relations of flowers and insects.
5. Name five important families of flowering plants, with three examples of each.
6. Name the ten indispensable elements of plant food.
7. Discuss transpiration.
9. Draw diagram of a flower, and tell function of each flower part.
10. State the chief contribution to botany of each of the following men: Linnaeus, Darwin, Pasteur, Gray, DeVries.

ZOOLOGY

1. Define homology, mutation, Arthropoda, ecology, phylogeny.
2. Sketch dorsal outline of the crayfish.
3. How is an animal "classified"? Illustrate.
4. Discuss "the immortality of the protozoa."
5. By what method is a breed of animals "improved" by man?
6. The mosquito in relation to disease.
7. Of our common birds, name six permanent residents, three migrants and three winter residents.
8. Discuss vestigial organs in the human body.
9. Name three common breeds each of cattle, chickens, dogs and horses.

10. Give the essential features of the Darwinian theory.

PHYSICS

1. Define specific gravity, energy, molecule, gyroscope, ether.
2. State the laws of motion.
3. Explain the rainbow, with diagram.
4. How is a Fahrenheit thermometer made?
5. Sketch the common suction pump; explain its action.
6. Define specific heat, latent heat, coefficient of expansion, surface tension, osmosis.
7. Explain construction of a common electric battery.
8. Importance of soil capillarity in agriculture. How controlled?
9. Explain with diagram the advantage of the pulley.
10. Name five great physicists, with important contribution of each.

The above, to one hunting for nature-study, may seem like a modern "puzzle picture", but questions 7 and 9 in zoology are suggestive. Whether "the average teacher" can distinguish—or even name—Jersey, Holstein, Hereford, Light Brahma, White Leghorn, Barred Rock, Collie, Great Dane, Fox Terrier, Percheron, Thoroughbred and Hackney,—whether she can or not, it is not a bad bit of capital to be able to do it, and the question, it would seem, is a fair one to put to any intelligent citizen who has had contact with domesticated animals.

What questions should be asked to ascertain the fitness of a person to teach children through nature-contact? Elementary teachers are examined in arithmetic, not in trigonometry. Should they be required to pass an ordeal in physical nature-study, or in mathematical physics? The Review would be interested to print the ideal set of examination questions to be put to prospective teachers in this field.

NATURE-STUDY NEWS

THE CHICAGO NATURE-STUDY CLUB (section of the A.N.-S.S.) held its second annual meeting Saturday, March 18, 1911, at Fullerton Hall, Art Institute. The excellent program, in addition to business matters, included the following papers:

School Museums, their Organization, Management and Use.....
.....Grant Smith, Chicago Teachers College
Junior Audubon Clubs. How to Organize Them .....
.....Miss Mary Drummond, Secretary of the Audubon Club..
Home and Community Gardens with Plans for Assistance to the Schools .....John W. Shepherd, Chicago Teachers College
School and Home Garden Work in South Chicago. (Illustrated with views of gardens).....Otis W. Caldwell, University of Chicago..
Birds, to Know them, to Appreciate and Care for them. (Illustrated)
.....A. H. Conrad, Crane Tech. H. S.

The second annual meeting of the South Side Section of the Chicago Nature-Study Club was held Saturday, April 8, with the following program:

Round About Chicago with the Nature-Study Club. (Illustrated)
.....Mr. Worrallo Whitney, Bowen High School
School Room Experiences. Pets in the School Room.....
.....Miss Mary Powers, Harrison Practice School
Blue Print Work.....Miss Mae Mardorf, Forrestville School
Interesting Pupils in Bird Study.....
.....Miss Cora B. Mowbray, Pullman School
Correlating English and Nature-Study .....
.....Miss Mary Bruining, West Pullman School
Butter Making.....Miss Rebecca Freeman, Taylor School
Two Summers in Yellowstone National Park. (Illustrated).....
..... Miss Mary Reynolds, Lake View High School

NOTES ON PERIODICALS AND BOOKS

The **Educational News Bulletin**, published by State Supt. C. P. Cary, Madison, Wisconsin, prints a letter from the Wisconsin Anti-Tuberculosis Association appealing to boys and girls of Wisconsin to enlist in the crusade against the white plague, "which sweeps away each year in Wisconsin 2500 persons, and from the ravages of which from ten to twenty thousand Wisconsin people are now suffering". The letter urges the purchase of the Red Cross stamps and offers two of the Gulick hygiene books to each pupil who sells five hundred stamps.

Nature and Culture is a most attractive little monthly edited by Eugene Swope and published from No. 4 West 7th Street, Cincinnati, Ohio. The illustrations are unusually choice. In the December issue an article by Henry Thol on "Some Snakes I Have Known" especially appeals to the writer of this note, who has never indulged in the popular antipathy toward the innocent members of the serpent tribe.

Manual of Agriculture for Secondary Schools—Studies in Soils and Crop Production. By D. O. Barto. Boston: D. C. Heath and Co. 1910. Pp. 89. Introduction by E. Davenport.

"The purpose of this manual is to outline a course of study in agriculture, covering at least one year's work, which shall be of high school grade, and shall offer training in sciences comparable to that furnished by the other science courses in good high schools." The work is confined to studies in soils and crop production, and is intended to accompany text and bulletin study. Thirty-six exercises are given, with sufficient test to develop the significance of the problems involved. The plan is well worked out and the manual will prove most helpful to those who wish laboratory guidance in secondary agriculture of high grade.

BOOKS RECEIVED

American Book Company.
Essentials of Biology. By George William Hunter.
Laboratory Manual in Biology. By Richard W. Sharpe.

The Gorham Press.
The Story of the Soil. By Cyril G. Hopkins.

D. C. Heath and Company.
Manual of Agriculture. By D. O. Barto.
Winslow's Geography Readers. By I. O. Winslow.
Book I. The Earth and Its People
Book II. The United States
Book III. Our American Neighbors
Book IV. Europe
Book V. Distant Countries

J. B. Lippincott Company.
The Study of Nature. By Samuel Christian Schmucker.
Under the Open Sky. By Samuel Christian Schmucker.

Benj. H. Sanborn and Company.
Field and Laboratory Note-Book in Physical Geography. By F. A. Merrill.

Sturgis and Walton Company.
An Out-of-Door Diary for Boys and Girls. By Marion Miller.

Witherby and Company (London).
The Liverworts British and Foreign. By Sir Edward Fry, G.C.B., with the assistance of Agnes Fry.
How to Attract and Protect Wild Birds. By Martin Hiesemann. Translated by Emma S. Buchheim.
Observing and Forecasting the Weather. By D. W. Horner.
Weather Instruments and How to Use Them. By W. D. Horner.

TIMELY REFERENCES ON BIRDS

Prepared By MRS. C. H. ROBISON, Upper Montclair, N. J.

(Editor's Note: The following references on the migration, courting and nesting of birds have been selected by Mrs. Robison with much care. All are from periodicals which are easily available to the majority of our readers, and are characterized by an easy style, with an element of anecdote and free from the condensation so common to text-books.)

SPRAGUE, L. T. Why do birds migrate? *Outing,* vol. 39; Oct., 1902; pp. 95-100. Good discussion of what is known of the migration habits of birds and the reasons for migration.

LANG, D. Great tidal waves of bird life. *Atlantic Monthly,* vol. 104; Aug., 1909; pp. 230-236. Migration. Good.

KNOWLTON, F. H. Journeyings of birds. *Popular Science Monthly,* vol. 60; Apr., 1902; pp. 323-335. Good. Scientific. On migration.

JOB, H. K. Northward with the shore bird host. *Outing,* vol. 45; Dec., 1904; pp. 321-327. Good photos. Migration of shore birds.

POWELL, E. P. Travellers of the air. *Independent,* vol. 64; Mar. 26, 1908; pp. 668-672. General article on migration. Good. *Perhaps* inaccurate.

HALL, A. N. Bird houses for the back yard. *Ladies' Home Journal,* vol. 26; Apr., 1909; p. 85. Illustrated.

BAYNES, E. H. Keeping open house for the birds. *St. Nicholas,* vol. 34; Jan., 1907; pp. 208-211. Suggestions for attracting birds in winter and summer.

IRWIN, F. Taming of garden birds. *Living Age,* vol. 236; Jan., 1903; pp. 75-81. Suggestions for attracting and taming birds. English.

SCHLEGEL, M. New ways of attracting and protecting birds. *Country Life,* vol. 11; Apr., 1907; pp. 638-640. Review of German book. Good suggestions.

CHAPMAN, F. M. Marriage customs of birds. *Collier's,* vol. 44; Mar. 12, 1910; p. 34. Illustrated.

BEEBE, C. W. Marriage tie among the birds. *Ladies' Home Journal,* vol. 26; Apr., 1909; p.10.

Courting and nesting days of birds. *Chautauquan,* vol. 33; May, 1901; pp. 134-137. Interesting discussion of courting, nest-building and rearing of young of some common birds.

SANDYS, E. Spring music in a marsh meadow. *Outing,* vol. 46; Apr., 1905; pp. 69-72. Discusses early spring calls and mating music of birds; not necessarily those restricted to marshes.

Oldys, H. Woodland music. *Lippincott's,* vol 71; May, 1903; pp. 803-810. Songs of birds translated into musical phrases.

Sprague, L. T. Bards of the bushes. *Outing,* vol. 38; June, 1901; pp. 287-290. Description of songs.

Is there a philosophy of birds' nest-making? *Review of Reviews,* vol. 39; Feb., 1909; pp. 233-234. Synopsis of scientific lecture by Dr. Aristides Mestra.

Stratton-Porter, Gene. Bird architecture. *Outing,* vol. 38; June, 1901; pp. 436-442. Description of nests, with good photos. *Outing,* Aug., 1901; p. 656; more pictures to illustrate preceding.

Rogers, J. E. Hunting birds' nests. *Country Life,* vol. 16; July, 1909; pp. 315, 346. Good photos of nests.

Thoms, C. S. Baltimore oriole's nest. *Country Life,* vol. 15; Apr., 1909; pp. 652, 654. A few observations.

Brooks, J. Days with a mother bird. *Harpers,* vol. 116; Feb., 1908; pp. 389-393. Observations on kildeer while nesting and on young birds. Real contribution to study of life history of birds.

Finley, W. H. How nestlings are fed. *Outing,* vol. 47; Dec., 1905; pp. 284-290. Good photos Not all eastern birds.

Clark, E. B. The unspeakable sparrow. *Outing,* vol. 37; Jan., 1901; pp. 405-411. Methods of getting rid of English sparrows and reasons for doing it.

Reese, A. M. Prolificness of English sparrow. *Science,* vol. 26; Nov., 29, 1907; p. 759. Investigation of nests to find number of eggs.

Watson, J. and others. English sparrow. *Living Age,* vol. 192; Jan., 1892; pp. 158-167. Learned debate on value of sparrow. Long and difficult.

THE
NATURE-STUDY REVIEW
DEVOTED PRIMARILY TO ALL SCIENTIFIC STUDIES OF NATURE IN ELEMENTARY SCHOOLS
VOL. 7 MAY, 1911 No. 5

THE EDUCATIONAL MUSEUM OF THE ST. LOUIS PUBLIC SCHOOLS

By AMELIA MEISSNER, Custodian

The disbanding of the St. Louis World's Fair in 1904 gave rise to a very modest institution known as the Educational Museum of the St. Louis Public Schools, which has gradually developed and extended its influence far beyond the original hope of its promoters.

The two delivery wagons employed exclusively for the museum are being sent out daily loaded to their utmost capacity, and come back to the museum equally loaded with the previous week's returns, all schools being permitted to keep the collections delivered for a week at a time. The teacher is provided with a museum catalogue and printed order blanks so that she may select and order illustrative material just as she sees fit. The delivery wagons reach every school regularly once a week.

The careful handling of the museum material by teachers and pupils is the best evidence of the high regard in which it is held. During the school year 1909-1910, when 23,152 collections, exclusive of books, were delivered to the schools, $15.60 covered all necessary replacing of broken glass, repairing of birds and animals—in short, everything which might be called legitimate wear and tear—while the cost of replacing lost articles was only $5.30. That the system of wagon delivery and collection of books has met with the same appreciative cooperation, is evidenced by the fact that during the same year only one book was lost and the wear and tear of books was kept at the minimum.

An interesting statistical exhibit shows the nature of the collections and books called for most frequently during the past school year. Here we find 5,933 calls for stereoscopic view collections, each collection averaging from six to ten views; and again, 2,225 calls for bird collections, each collection averaging from five to eight birds; also, we find 2,015 calls for reference books

explanatory of the museum material, each book probably having served several teachers during its two weeks' issue period.

EXTRACT FROM EDUCATIONAL MUSEUM REPORT

For Year 1909-1910

Nature of Material	Collections Ordered
Food products	3,507
Clothing and shelter	3,128
Other commercial products	667
Sea life	1,397
Insect life	946
Mounted birds	2,225
Other mounted animals	674
Plant life	1,493
Minerals	1,339
Stereoscopic views	5,933
Charts	1,480
Lantern slide lessons	1,492
Physical apparatus	1,602
Miscellaneous material	240
Total number of collections ordered	26,123

LIBRARY REPORT

Nature of Books	Number Ordered
Reference books	2,015
Pedagogical books	719
School reading—ethical stories	580
Philosophical books	230
Books renewed	821
Total book issue	4,365

During the year 1909-1910 one school availed itself of the convenience of wagon delivery of books to the extent of two hundred two individual volumes, many of which served several teachers during the two weeks they remained on hand. Another school used 1,689 museum collections, most of which served their purpose in several class rooms before being returned to the museum.

That the Educational Museum has been, and is still, steadily growing in the scope and value of its work, is evidenced by another interesting extract from the museum statistics.

EXTRACT FROM EDUCATIONAL MUSEUM REPORT

School Year	Books Delivered	Collections Delivered
1905-1906	0	5,011
1906-1907	300	11,830
1907-1908	2,748	16,690
1908-1909	3,368	19,153
1909-1910	4,365	23,152

However, the best evidence of the steady growth of the Educational Museum is the fact that the 1911 catalogue, just issued, lists 1,742 individual collections as compared with 366 collections listed in the 1906 issue. Including all duplicate collections made up and in process of being made up, the museum now owns some 6,800 collections and 7,000 books ready for distribution to the schools.

In addition to this constantly traveling material, the museum maintains a reading room in connection with its library department, and a display room or "study hall" in connection with its museum department.

In this reading room are to be found, in addition to the seven thousand volume regular library, all recent and many earlier United States Government Reports, and thirty-two of the best educational magazines, indexed since 1906, thus making them readily accessible to the reader. All of these magazines and Government Reports, except the current number, may be ordered by wagon delivery just as the other books and museum material are ordered.

In the display room complete sample collections of all traveling museum material are displayed in readily accessible cases, so that the teacher may gain a better acquaintance with the material available than the catalogue alone could give her. In addition to these samples of the traveling collections, the display room also contains much valuable material which it would be impractical to transport to the schools. For the study of such material, classes of pupils in charge of their teachers are permitted to visit this room from time to time.

The effectiveness of the delivery system from one center, instead of supplying each school permanently with a set of museum collections, is shown in the diversity of material called for by the various schools. If all were supplied in like measure, much material would necessarily lie idle in those schools which, under the present favorable conditions of supply, order but

slightly; whereas, those schools which are now using from five hundred to fifteen hundred collections annually would be greatly restricted. Some of the schools which order but lightly are located near nature's sources of supply; hence the folly of stocking them with the same material as is needed in the down-town schools, where nature seems so far away.

Again, looking at the matter from the standpoint of expense, the six thousand stereoscopic views, for instance, which the museum owns—covering a wide range of subjects, all listed in the catalogue—represent an outlay of $1,000. It would be an unwarrantable expense to equip all the schools with such a range of views when from six to ten duplicate sets now supply ninety per cent. of all requests. These stereoscopic views are in such favor that many of the schools have invested in a set of twenty or more stereoscopic instruments to allow of the free use of views, as it is manifestly impractical for the museum to supply as many scopes as views. Many of the schools are also equipped with their own stereopticon, and the thirty-two hundred museum lantern slides, representing an outlay of about $1,200, are thus kept in constant circulation.

Another important feature in favor of the traveling museum is the fact of its keeping alive the interest in the museum specimen by the absolute regularity, once a week, of the museum wagon's call; thus obviating all danger of the specimen being detained an unreasonable length of time in any one room of the school.

That the public, outside of immediate school circles, is becoming interested in the museum, is shown by the many valuable donations of collection material which have been received from public-spirited citizens of late; while the fact that the traveling museum idea also finds warm friends eleswhere than in St. Louis, is attested by its daily visitors, educators and students from other cities, who invariably express their appreciation of the work in progress.

The nature-study movement, so prominent of late years in all cities, has gained additional strength in St. Louis through this practical use of objective material, arousing in the pupils and teachers a desire to know more about the specimen studied, which desire naturally leads to closer observation on incidental field trips, and finally to regularly planned field trips just for the purpose of studying nature and investigating some of her innumerable mysteries.

THE SCHOOL MUSEUM[1]

By GRANT SMITH, Chicago Teachers' College, Chicago, Ill.

I. WHY THE SCHOOL MUSEUM IS DEMANDED

A few weeks ago at the Mobile meeting of superintendents, a speaker referred to what he called the failure in school organization and the failure in book knowledge. It does not seem so much a question of failure as of inadequacy to the present situation. Systems and methods efficient for our parents or for our own childhood are today actually ineffectual with the children of the city. We find an explanation of this fact in the peculiar limitations and shortcomings of city life. Book education was fairly satisfactory in the boyhood of Washington and Lincoln, because the less artificial conditions under which they lived furnished countless informal, unconsciously educative experiences in life outside the school; and the same thing has been proved in the case of many of those here present. Book knowledge in itself does not fail. It is merely insufficient unless it has a broad foundation of rich experiences, in which case it then rapidly assists the learner to interpret and organize and recreate his experiences into real and personal knowledge. Neither does the modern school organization fail in communities in which the life of the children outside the school is made rich by learning the primitive arts and by free intercourse with nature. It is the narrowness, the one-sidedness, the dearth of adequate outside experience which nullifies much of our effort in the cities. Whittier's "Barefoot Boy" was not vitally in need of a school museum as a part of the organization in his education. The great out-of-doors, the home, and the primitive community complete in itself were his museum. If he gained, in addition to this very natural form of education, the art of reading, of writing, of numbers, and a little book interpretation of nature, the "Barefoot Boy" was on the highroad to efficiency and power. Book knowledge is only one of the wheels in the complex machinery of the efficient life. In the past, the schools had only the comparatively simple task of helping the children to organize and interpret their own rich, home-gained experiences. But because the children of the cities are cut off from the most of these educative activities, the modern city school has before it the additional and difficult task

[1]Read before the Chicago Nature-Study Club at the annual meeting, March 4, 1911.

of actually supplying as many as possible of the fundamental experiences without which book knowledge does fail.

It is the more or less clear recognition of these facts which makes teachers demand, as they have not done heretofore, that book knowledge and imaginative experiences be based on previous contact with real situations and materials introduced into the instruction by every legitimate means possible.

Such being the facts, it is evident that some sort of school museum must come to be a part of the ordinary equipment of the schools. There must be some place, call it what you will, into which there may be gathered certain materials with which the children may learn by doing, by finding out about, or settling things, in order that we may replace a mere memoriter acquaintance with the fruits of the intelligence of the race by activities similar to those by which the race produced these fruits. These activities may not arise to the dignity of experiments and researches in the sense of high school and college work, nor be engaged in from the same motive, but the place where the materials are stored and organized may fairly be called a school museum. The scope of such an instrument of education is limited. This should be clearly understood. It is not a panacea; but it is both legitimate and important in the present effort to turn the pendulum of instruction away from mere conversational exercises about objects and phenomena to fresh experiences with them, after which only, is discussion profitable.

II. THE ORGANIZATION AND MANAGEMENT OF THE MUSEUM

In some cities attempts have been made to supply illustrative material to individual schools from a central bureau. I do not contend that such an arrangement cannot be made worth while, but the difficulties in the way of making it so are not few. The value of the bureau of geography, which the board of education in Chicago until recently maintained, for several years did not seem to warrant its continuance. If there were no other grave difficulty in managing a central bureau, the fact that it would do for the individual school much of what they should do for themselves makes the value of the central bureau doubtful. Certainly there should be school museums whether there is a central bureau or not, and there should be a clear differentiation in functions. If a city lacks such valuable institutions as we have in the Chicago Academy of Science and the Field Museum, a central school museum would be most desirable. But no central institution for a whole city can serve the purpose I have in mind.

I am confident that each school should plan for its own collection of materials and have some common place in which they and the annual supplies furnished to the schools may be organized and kept. That few schools have any such arrangement is evidence of the inadequacy of our school organization.

Experience with a sort of school museum for several years has convinced me that great value can come only from a clear understanding of what it should not be, quite as much as of what it should be. I shall therefore discuss briefly two or three items from the former point of view.

First. The school museum primarily should not be organized as a show place for a collection of materials for public exhibition patterned after public museums or academies of science. If material is exhibited (a thing which is legitimate in certain directions), that feature should be made very subordinate. In Chicago, for example, let us be content to permit these public institutions which I have mentioned, to continue and push forward the very admirable work which they are incidentally trying to do for the schools. Would it not be well indeed to ascertain if it may be possible to incorporate certain features of the help they now afford us still more definitely with the course in nature-study? But let us not make our school museum a little model of these larger institutions. Let us give it a distinct function of its own. Following the efforts of Dr. Eliot and other reformers many years ago, school museums were started in several places in this country. The movement fell by the wayside, because those who acted on the impulse for reform attempted to carry out too many of the features of these larger public institutions. Much of the effort of the individual teachers consisted in chasing down scientific names and mounting and arranging specimens brought in by the children. That was a burden impossible to be borne even in that day of the less crowded curriculum. Some of the persons concerned gained a sort of ephemeral renown, but in this way they helped to set back for a generation a reform which is only now being rejuvenated. We want teaching museums, not show rooms.

Second. The school museum should not be organized and maintained to serve the ends of nature-study and geography only. Into it should be gathered all sorts of material appropriate for use in all of the subjects of study in all of the grades of the school. It is becoming more and more clear to teachers that subjects like reading, literature, spelling, history and arithmetic frequently require the supplementary use of material in order

to enable the children to gain sufficient experience to make possible a reasonably adequate interpretation or imaginative recreation of the subject-matter. It is doubtful if nature-study would ever have been introduced in the curriculum as a separate subject if teachers had not neglected to provide the children with these so-called illustrative experiences. To the degree in which nature-study is mere talk about nature, instead of experiences of all sorts, first of all, with nature and nature materials, its illustrative or correlative value for other subjects is still slight. Education at present suffers from the lack of these illustrative experiences, and the school museum may be made extremely valuable to all subjects of study in this connection.

Third. The school museum should not be a collection of formal or stereotyped apparatus, or plant and animal material to be used in the place of that which the children can reasonably be expected to make or collect for themselves. It should rather be a storeroom for the raw material from which things can be made or found out. I know there are those who have the opposite view, but they fail to see the real purpose of the use of material in education. Knowledge gained from material should come through as many senses and employ as many activities as possible, and the getting of knowledge so should necessitate, wherever possible, the acquiring of useful skill. Such an end can seldom be attained with formal, purchased apparatus. As David Starr Jordan expressed it recently in regard to excessive equipment in scientific laboratories, "students are strengthened by endeavor, not by facilities".

Fourth. The purpose of the museum is not to provide material concerning which the teachers may merely talk and perform demonstrations before the pupils. I do not mean that this should never be done, but I mean that it should seldom be done. A scientist connected with one of the local institutions expressed to the writer grave regrets that such a slightly educative use as the one I have just condemned was made of materials which he took the trouble to place at the disposal of some of the teachers. This gentleman thinks that individual effort and responsibility on the part of the pupils concerning some definite end to be attained, or in other words, "experience, is the best school master".

To be affirmative, I hope I have just made it clear in connection with the above negations that the school museum above all in large cities should be an unostentatious scheme for providing children with material for some of the activities of which city life tends so to deprive them. All of the efforts of the busy

people concerned with it should be aimed at encouraging in the children purposeful activities which shall contribute in a cumulative way to the attitude of mind and skill of hand characteristic of creation rather than of mere action. This attitude is one of delight in solving of problems of increasing complexities from grade to grade, of settling things, of "making knowledge" in a sense, of making it come true for oneself.

Furthermore, the material gathered into the school museum must be of such a nature and be so arranged or prepared that the pupils may have many and varied experiences with it. The "wonders" and "curiosities" of nature, as well as material which cannot be handled and used, should not be admitted except to serve as a preliminary device for stirring up interest and activity in accordance with some very definite aim of the teacher. Bottled up and otherwise encased material which the children can merely see, but cannot taste, touch, smell, handle, or work upon, or concerning which there is no serious thinking to be done, no more or less sustained problem to be solved, is usually of little value.

The school museum should be the work of the children as far as possible, not done for the sake of doing it, but in connection with some interest on which they are engaged or on which other children are engaged. Exchange of material between different schools of the city and of the country at large for definite purposes is an entirely practicable project to undertake. There is much material of real value for use by children of one age or another which has been prepared for advertising and other purposes and this should be collected. There are construction problems of various kinds which may have such a correlation with this work as to make them seem of real value to the children. For example, cardboard construction has not been productive of great good, in the opinion of many teachers, for the reason that the work has lacked a convincing motive; but the preparation of museum material offers many very good problems in this line. Another legitimate way in which the childrens' interest in the museum should be secured is by placing superior examples of their work in the collection. It must not be forgotten also that the children should have a definite share in the management of the museum.

The limitations of this occasion prevent extended discussion of the specific material which should appear in the school museum. Probably the minds of all the teachers present have run ahead of the speaker long since and created a museum com-

plete according to the liking of each. I shall refer particularly to one or two features on which I have strong opinions. One of these items is that of pictures. They are very important in all subjects of study, and I feel that the pictures for all pupils who have learned to read should be accompanied by sets of questions to be answered or things to be done, in order to make the use of pictures more valuable than it has sometimes been in the past. For nature-study, there will be pictures of plants, flowers, trees, shrubs, fruits, vegetables, and crops, pictures of parks and gardens, pictures illustrating the principles of home and school-ground decoration, pictures illustrating the use of vacant lots for gardening and the beautifying of the neighborhood with plants. The pictures of animals are very important too, especially the pictures of birds. I hope that none of you are planning to supply the school museum with stuffed or mounted bird skins. I wish here to protest against those nature-study leaders who advocate any such thing. Let the public museums perform their proper functions, and let the tens of thousands of schools refrain from contributing to the killing of birds to supply children with their skins for study. If we do not use care, the birds will go the way that many of the wild flowers have gone and are going, which in the name of the love of nature we have trodden out or plucked to the point of extermination, never realizing until recently that we can do the greatest good to the greatest number, not merely by taking the few out to view nature, but by bringing the wild plants into the towns and cities and growing them, as is done in certain places in Europe, in the home, the garden, and the park. Cannot this club influence the commissioners of all the city parks to start and protect wild flower gardens? In the case of the birds, let us renew our efforts to interest the children in attracting them as far into the city as possible and in studying the living birds rather than their stuffed skins.

In general, for nature-study, the museum should contain as much as possible of the essential material for carrying out the course of study, and this would also be true for the other subjects of the curriculum. Let each teacher recall the material he or she has so devoutly wished were available for use in connection with the teaching of the various topics in arithmetic, reading, literature, geography, nature-study, household arts, manual training,—in fact, in the teaching of all of the subjects of the curriculum. Those are the things we should gradually collect. The project is practicable and the situation urgently demands it.

The management of the museum is naturally one of the most

important factors involved. Probably many plans will be tried before the question is solved. It occurs to me that the room devoted to a museum should be connected with the principal's office if possible; and in schools large enough to secure the services of a clerk, the latter might devote certain periods of the day to the museum. It would probably make for efficiency if some of the material, even at the risk of duplication, be arranged by grades, if it all be catalogued according to some system like that of the libraries. Definite records, according to this system, could then be made of the removal and return of material. This is not as large a task as it sounds, if it be systematically entered upon.

It is a mistake to suppose that expensive cases are necessary for the storing of material. Letter files and various forms of pasteboard filing boxes are extremely serviceable and really much more convenient than many of the expensive contrivances. Improvised filing cabinets and boxes which cost nothing are often as useful as any. Much of the equipment of the museum can be constructed by the children in their regular handwork.

I would discourage the undertaking of a feverish campaign to collect material for the museum, such as always characterizes the preparation of material for a public exhibition. Let us take up a leisurely pursuit of the definite policy of gradually adding materials useful in teaching each subject. What is needed first is determination and a definite beginning.

Mr. President, I suggest the appointment of a committee[2] of this club who shall report, either at a future general meeting or by circular to the individual members, in some detail, suggesting specific materials. What is needed next is a place for such a collection. Most of the schools of the city have some place which can be adapted to the purpose. Cases placed in the halls can be used until something better is provided, but it must not be forgotten that the fire regulations and the use of the halls for classes in physical education will not permit of sufficient development in this direction. A basement room is better than none. I suggest further the adoption by this club of a resolution[2] addressed to the superintendent and the board of education advocating that all school buildings to be erected or added to in future be provided with room for a teaching museum.

[2]Action was subsequently taken to carry out the above suggestions.

THE PLACE OF OBSERVATION IN NATURE-STUDY

By GILBERT H. TRAFTON, Clifton, N. J.

Now that the first waves in our educational system caused by the introduction of a new subject, have passed and the ripples subsided, the perspective given by even these few years helps to furnish a clearer view of the place and purpose of nature-study.

Nature-study has contributed something of permanent value to education by furthering the development of initiative and individuality in the child through offering observation as a method by which he may acquire knowledge directly by the use of his own powers. It has also quickened the idea that education should relate to the child's immediate environment. These contributions will remain, but if nature-study itself as a separate subject is to continue and perform its functions effectively, it must be brought in line with modern psychology and pedagogy.

The abandonment of the old faculty psychology and the very radical modification of the theory of formal discipline now generally accepted, must have an important bearing on aims and methods of nature-study. We can no longer entertain the idea that there is a general power of observation which can be trained by observing anything, and that this power once trained can then be turned to use in any field. The power of observation is specific. Instead of being content to allow the child to observe any material that may be available we must direct the child to observe those things which in themselves are worth observing on account of the relation which they bear to his life. If there seem to be in nature some things which the child should observe, then specific training in the observations of these particular objects should be given.

Thus, in the first place, a very careful selection of material is necessary. Furthermore, having decided on the objects worth observing, it will not suffice merely to have the child observe anything and everything about the object in question, but he should be lead to observe only those features which are worth observing. Thus there is necessitated not only a careful selection of material but also a careful selection of the line of observation to be followed.

The relation which these things bear to the child's life may be taken as the basis for this selection. The child should see that the work is related to something that interests him and so is

worth while. The observation should be guided by specific, clear-cut problems within the child's comprehension. The amount of observation called for will depend upon the nature of the problem. In some cases it may be an important factor, in others it may play but a minor part.

Observation for its own sake cannot be justified as the aim of nature-study. This narrow conception has helped to bring the subject into disrepute and has sometimes been the cause of the apparent conflict between agriculture and nature-study. Observation is not an end in itself, but simply a means to one end. The introduction of this new method of study was such a radical departure from the method in common use, that it is not to be wondered at that for a while undue emphasis was laid upon it. It should now be given its proper place as secondary to and controlled by some large aim expressed in terms of things that interest the child.

The effect of applying the suggestions here given would be to lessen the importance attached to observation, but it would give a more rational and symmetrical perspective to the whole subject of nature-study. Too often the work in nature-study has consisted merely of aimless observations alone and the work has stopped there, whereas this should be but the starting point. Observation is simply a means of gathering the raw material which is to be used, and the chief value of observation consists in the fact that it constitutes a new way of gathering this material quite different from the book method used in most school subjects. But the work should not be allowed to stop at this point, but should be organized around some vital problem and carried through to some real issue. A nature lesson which consists of observation alone may be quite as deficient as one in which observation forms no part.

Observation is an extremely desirable feature in nature-study as a starting point, but there are many congested city districts where any large amount of observation on living material is out of the question. Yet, even under these conditions it is possible to carry on the organization of the topic in a manner similar to that used in other topics, although the work must be done under serious disadvantages and at a great loss. In these crowded districts the child lives in such an unnatural environment that it is worth while to try to teach him something of the world of nature which everywhere surrounds him at no great distance, but from which he is temporarily shut off.

The writer is well aware that much work in nature-study has been open to just criticism because it has consisted simply of book work, even in regions where material for observation is easily available. In his own experience in supervision, the writer has encountered this tendency as a common defect in nature teaching. Under these circumstances, it may seem almost dangerous to express the thoughts mentioned in this paper. But it is not the wirter's intention to minimize the value of observation, but simply to attempt to point out its true place, and merely to hint at some of the larger and more vital problems which are possible in nature-study.

TIME ECONOMY AND TEACHING DEVICES

By C. H. ROBISON, State Normal School, Upper Montclair, N. J.

In anticipation of the busy September days, many teachers often wish to make during the summer some leisurely preparations for observation work. So far as insect study is concerned, their consciences are usually eased by accumulating a large mass of more or less unsorted material in formaldehyde against the day of destruction—euphemistically called "dissection".

Having large numbers of students, whether in normal or high school classes, necessitates the introduction of factory methods, even at the risk of making the instruction seem machine-made (not mechanical). Every teacher who has attempted to bring out points of insect wing structure, especially by a comparative study of different species, will recall what a quantity of material, often collected with difficulty, and sometimes plentiful only at long intervals, has been slashed and mangled in the pupils' vain efforts to extract some frayed out under wings. Those of grasshoppers (locusts), giant waterbugs and beetles are usually unfit for observation after the rough treatment of clumsy fingers. The instructor must repeatedly tell what the shape should be, or, neglecting the rents and tears, make on the student's drawing an outline. For how very observant are young people of air bubbles, rents, holes, and of other things they are supposed not to notice!

The writer has tried picking off a quantity of wings and keeping them in formaldehyde till needed. But even then the students succeeded in mangling the material beyond recognition in attempting to flatten out the folds of the wings of the locust or waterbug, or to straighten out the joint of a beetle's flying

wing. Even when done on a moist plate, the folds persist in flying back into place, which, of course, illustrates some features of its workings. Many such features must be made out, if at all, on material that may be torn with impunity; but students cannot advantageously use such material for the study of many points.

The time-saver described below has been satisfactory in some respects.

On a glass slip are placed the following: (a) upper wing of locust, (b) under wing folded naturally, (c) under wing spread. These are fastened with glue until they can be covered with another slip and the two fastened with passè partout. The best binder is the kind used for lantern slides, especially that put up in ten-yard rolls. The joint of the giant waterbug's upper wing is so thick that the slips do not bind well unless separated at one end by one or two thicknesses of an eighth-inch strip of cardboard. Half of the locust preparations might be some species with edged under wings, as the Carolina locust, and the other half, a species with clear under wings, like the red-legged locust. The label may be pasted in before the slips are bound together.

Readers of the early numbers of the Nature-Study Review will easily trace the writer's idea to the article, "Nature-Study with Insects", by Professor Hodge, in vol. 2, no. 8, (November, 1908) pp. 265-270.* A surprisingly large number of well-informed teachers have not heard of the method there described of taking care of insects in small units, for it is common experience that a case of fifty insects is not of the practical value it should be. Normal schools may often easily get good collections from their state agricultural colleges or state entomologists at a cost of a few cents a specimen, especially if containers for shipment are sent by the purchaser. Such collections may be broken up and one or two specimens placed in a case, even though the student has not himself collected the stages of a life-history, as was Professor Hodge's purpose.

For the present reference his method may be briefly summarized. Spoiled photograph negatives, 4x5 or other standard sizes, are used as top and bottom of a case whose sides are formed by a thin wooden strip notched to allow it to be bent at the corners, the glass being fastened by binding strips. If the glass is not also glued to the wooden strip as suggested, it is easier to open

*Although vol. 2 is out of print, the November number can be obtained.

the case to make changes or repairs. The wooden strips are still furnished by A. I. Root, Medina, Ohio, dealer in bee supplies, for approximately a tenth of a cent each in quantities. In addition to the rather refined methods of gluing the insects, suggested by Professor Hodge, specimens that are bought with pins already in them may be mounted. After sticking the pins into bits of cork they may be glued to the glass; then the pins may be cut off to suit the thickness of the case. Pins will not be particularly objectionable in specimens meant only for normal school students, except as they may imitate the same method. Pins holding larvae or small insects may be stuck directly into the wooden sides.

Normal and high school teachers often feel keenly the lack of *working* material on life-histories. A plan that does well for table distribution, that can be used over and over and that requires a minimum of time to prepare, is to place specimens of all available stages of an insect in as small a bottle or homeopathic vial as will accommodate them; e. g., a young and adult squash bug, two or three stages of locust, a cicada and cast, June and potato beetles and their larvae, duplicates of various caterpillars. The fly life-history may be put in either of the following ways: an insect pin piercing a pupa, an empty puparium, and an adult may be stuck in the cork before it is inserted into the empty bottle; or these may be placed, together with a maggot, in preservative. A series of these life-history bottles may be placed in a tray for each one or two pupils and be used comparatively. Some stages, as dragonfly nymphs, may be more easily bought than collected. Incidental advantages of the method just described are, that the filled bottle itself acts as a magnifier; a hand lens may readily be used; the specimens do not have to be sorted out and replaced in stock bottles with the consequent wear and tear; they are not left on the tables to dry out between recitations of different sections of the class; and difficulty with supersensitive or mischievous pupils is reduced to a minimum.

Pasteboard boxes may contain duplicate collections of several varieties of chrysalids and empty cocoons, or short, two and three-ounce bottles may be used to display the cut-open cocoon and the pupa taken from it. Cocoons ordered from C. S. Brimley, Raleigh, S. C., if kept in a breeding cage and frequently observed during April and May, will usually provide a few maggots and pupal stages of the fly as well as several large ichneumons.

While not exactly belonging to the class of time-saving

devices, it may be said that breeding cages are as easily made as bird houses, though the prospective teacher often seems not to realize the simplicity of the manipulation without actually passing through the experience as a class exercise. The simplest cage consists of a cylinder of wire screen netting made just the size to fit into two pie pans forming the top and bottom. Such a cage is easy to get inside of by lifting off one pan, either to replenish the food supply or to clean. The edges should overlap an inch and be sewed by coarse stitches with a raveled wire. The expense of the tins can be saved by using a pasteboard box and its lid, anything from a stationery box up. The wire netting must then be bent over the edge of a table to form the square corners. Careless students are apt to make the sides of the wire netting larger than those of the box and not to get the overlapping edges flat, leaving a place in which insects may get wedged. Heavy galvanized netting makes the best permanent cage. The netting of cages not used after being made may be flattened out and used again.

The making of cages may be open to the objection of belonging to manual training. So it well may. In fact, nature-study, whether of elementary or of secondary grade, may quite properly furnish the motivation for part of the manual training work. The making of "exercises" belongs to a past chapter of manual training theory. Breeding cages, mounting boards, aquaria, and similar adjuncts of nature-study may as properly be considered a part of a young teacher's equipment as a lesson-plan book, clay pigs and Esquimaux boys, or carpet looms, all of which will probably be accumulated from work in the manual training department.

Possibly it may seem heresy to suggest that it is not the chief province to "train the hand", or that the organized work of the manual training department can do it better. There are doubtless biology teachers who still believe in a sort of generalized "skill faculty" that will be developed and trained for efficient service in all directions by plenty of practice in a line so far removed from ordinary life activities as is the dissection of small animals. The trend of psychology, however, is away from this belief. To any such teacher the above suggestions regarding time-saving devices may not appeal very strongly. But several things should be borne in mind, among which are these: (1) More high schools have but one teacher than have five or more, while high schools with three or less are ten times as frequent as those with more than ten teachers. (2) By far the greater number of high schools,

and many normal schools, can give but four or five single periods a week to any science, or must omit science from their course of study. (3) As once suggested by Professor Thorndike, one of the great contributions of science to secondary education is the principle of verification. This can often be accomplished better by careful observation of a preparation that is good than of one that is spoiled in the making. (4) An excessive amount of time spent in "dissection" (and also in drawing) simply crowds out the proper consideration of many important topics. (5) The kind of dexterity acquired by high school pupils making their own preparations is not the kind needed in after life so much as the kind of dexterity acquired in the manual and domestic arts, and these lines of endeavor should have the benefit of any time that can be spared. There cannot be enough skill gained in the use of dissecting instruments to be of appreciable benefit even to a prospective surgeon, and he must get his special training elsewhere.

The best sanction for the manipulation of the materials is the probability that the student in college or normal school may have some occasion himself to prepare materials in his own future work. Even such persons as these always may and often must get this special training in teachers' courses in our summer schools.

A very regrettable error appeared in the last (April, 1911) number of the Nature-Study Review. The article, "Studies of Aquatic Insects", which should have been credited to Gilbert H. Trafton, Clifton, N. J., was by mistake placed under the name of L. S. Hawkins, Cortland, N. Y.

NATURE-STUDY ON THE PROGRAM

By JOHN DEARNESS, Vice-Principal Normal School, London, Canada

No other adverse criticism of nature-study is more frequently heard that that it is disconnected, desultory, unsystematic. The majority of those who urge this objection very probably confuse nature-study with formal science and estimate its value by the kind and amount of scientific knowledge acquired. The nature-study teacher does well to keep Dr. L. H. Bailey's dictum in mind—that when the teacher's attention is focused on subject-matter he is likely teaching science; when on the child, he may be teaching nature-study.

There is, however, ground for this criticism by those who fully understand the nature and means of heuristic education, on account of the irregular and spasmodic way in which the subject is pursued in many schools. There are teachers who do not even give it a place on the program (or time-table, as it is usually called in Canada) for the alleged reason that it should be taken at the irregular and often unanticipated times when occasions for the lessons arise. The writer in this vein recommends by way of illustration that the ordinary routine of lessons be interrupted to teach one on the emerging cecropia, that when the lightning is flashing and the thunder booming is the time to teach a lesson on the thunder storm, and so on.

I have nothing to say against teaching extraordinary lessons at extraordinary times, but there is abundant material for the richest if not the most impressive nature lessons in the multitudinous commonplaces of nature and experience, and for these a time may be assigned on the program. In the study of weather in the December, 1910, number of the Nature-Study Review, I advised that the first two to five minutes after the opening exercises is a suitable time for reporting observations. The daily nature-study lesson of from fifteen to twenty minutes may be proceeded with then, but there are reasons in favor of giving it the last period before the noon recess. If at first twenty minutes cannot be suitably filled, take fifteen or ten. A serious, systematic beginning will open the field and deepen the interest until the temptation will become strong to exceed the proposed twenty minutes.

Some days a single topic will fill the time, but usually several topics that are being carried along concurrently will come in for some share of attention. Much of the observation and some of

the experimental work will be assigned in the school period to be carried on or performed out of school hours, the results to be reported and discussed on the following or some other day subsequent to the assignment. To illustrate, the class may be concurrently observing the germination of seeds, the comparison of the dog and the cat, the effects of each wind upon the weather, the building of a bird's nest and the digging of a drain taking place near the schoolhouse. An observation or experiment proposed in each of two or three or all of these studies yesterday may be taken up today. Some of them may occupy but a minute or two while another may nearly fill the time.

It will be interesting to hear from a teacher who is disappointed with the results after seriously making an intelligent attempt to give nature-study a reasonable time and a fixed place on the program.

WHAT NATURE-STUDY DOES FOR THE CHILD AND FOR THE TEACHER

By ANNA B. COMSTOCK, Cornell University, Ithaca, N.Y.

When the first attempts to introduce nature-study into the schools were made, there were many prophesies favorable and unfavorable as to what would happen to teacher and pupil if this study of nature should finally become established. In looking back over the evidence that has reached us at Cornell University, it is interesting to note which of these prophecies have failed and which have been fulfilled.

WHAT NATURE-STUDY DOES FOR THE CHILD

One of the first and foremost of the prophecies of the croaker was that nature-study would so surfeit the child that when he came in later years to study science he would hate it. And this might have been true if elementary science and nature-study had been identical. It is, however, a well accepted fact in schools where nature-study is best taught that the pupils are eager for their science in the high school. Moreover, in some schools we know, the nature-study pupils are so far in advance of those who have not thus been favored that separate classes for them in the sciences have been necessary.

Another bit of evidence has come to us from many quarters that nature-study, more than most studies, cultivates the child's

imagination and at the same time his truthfulness. There are many wonderful true stories which he may read with his own eyes which affect his imagination as much as do fairy stories. At the same time he understands perfectly that an observation as to the habits of any bird, animal or plant must be accurate or it is of no use. Nature-study cultivates in him a perception and a regard for what is true, and he finds within himself the power to express it. I have always held that at least half the falsehood in the world if due to lack of power, first, to detect the truth, and second, to express it. Nature-study aids both in discernment and expression of things as they are.

In the many pictures and letters which the children of the Junior Naturalist clubs have written us, we have been able to establish clearly that nature-study cultivates in the child a love of the beautiful; it brings to him early a perception of color, form and music. He sees the azure on the wing of the butterfly as surely as in the sky above him. The lowliest and commonest of flowers teach him to look for beauty and form beneath his feet. He reads the music score of the bird orchestra and learns to know which birds sing the different parts. And more than that, nature-study gives the child a sense of companionship with the life out-of-doors and an abiding love for nature. I believe this latter should be the teacher's criterion for judging his or her work. If nature-study as taught does not make the child love nature and the out-of-doors, then it should be given up.

Perhaps the most valuable practical lesson the child gets from nature-study is a personal knowledge that nature's laws are not to be evaded. Wherever he looks he discovers that attempts at such evasion result in suffering and death. A knowledge thus naturally attained of the immutability of nature's "must" and "shall not" is in itself a moral education. That the fool as well as the transgressor fares ill in breaking natural laws, makes for wisdom in morals as well as in hygiene.

Out-of-door life takes the child afield and keeps him in the open air, which not only helps him physically and occupies his mind with sane subjects, but keeps him out of mischief. It is not only during childhood that this is true, for love of nature counts much for sanity in later life. This is an age of nerve tension, and the relaxation which comes from the comforting companionship found in woods and fields is, without doubt, the best remedy for this condition. Too many men who seek the out-of-doors for rest at the present time can only find it with a gun in

hand. To rest and heal their nerves they must go out and try to kill some unfortunate creature,—the old, old story of sacrificial blood. Far better will it be, through properly training the child, that the man shall be enabled to enjoy nature through seeing how creatures live rather than by watching them die.

WHAT NATURE-STUDY DOES FOR THE TEACHER

During many years, I have been watching teachers in our public schools in their conscientious and ceaseless work; and so far as I can foretell, the fate that awaits them finally is either nerve exhaustion or nerve atrophy. The teacher is apt to become either a neurasthenic or a "clam".

I have had conversations with hundreds of teachers in the public schools of New York State concerning the introduction of nature-study into the curriculum, and most of them have declared, "Oh, we have not time for it. Every moment is full now!" Their nerves were at such tension that with one more thing to do they must fall apart. The question in my own mind during these conversations was always, "How long can she stand it?" I asked some of them, "Did you ever try a vigorous walk in the open air in the open country every Saturday or every Sunday of your teaching year?" "Oh, no!" they exclaimed in despair of making me understand. "On Sunday we must go to church or see our friends, and on Saturday we must do our shopping or our sewing. We must go to the dressmaker's lest we go unclad, we must mend, and darn stockings! We need Saturday to catch up."

Yes, catch up with more cares, more worries, more fatigue, but not with more growth, more strength, more vigor and more courage for work. In my belief, there are two and only two occupations for Saturday afternoon or forenoon for a teacher. One is to be out-of-doors and the other is to lie in bed, and the first is best.

Out in this, God's beautiful world, there is everything waiting to heal lacerated nerves, to strengthen tired muscles, to please and content the soul that is torn to shreds with duty and care. To the teacher who turns to nature's healing, nature-study in the schoolroom is not a trouble; it is a sweet, fresh breath of air blown across the heat of radiators and the noisome odor of overcrowded small humanity. She, who opens her eyes and her heart natureward even once a week, finds nature-study in the schoolroom a delight and an abiding joy. What does such a one find in her schoolroom instead of the terrors of discipline, eternal

watching and eternal nagging to keep the pupils quiet and at work? She finds, first of all, companionship with her children; and second, she finds that without planning or going on a far voyage she has found health and strength.

The old teacher is too likely to become didactic, dogmatic and "bossy" if she does not constantly strive with herself. Why? She has to be thus five days in the week and, therefore, she is likely to be so seven. She knows arithmetic, grammar and geography to their utmost and she is never allowed to forget that she knows them, and finally her interests become limited to what she knows.

After all, what is the chief sign of growing old? Is it not the feeling that we know all there is to be known? It is not years which make people old; it is ruts, and a limitation of interests. When we no longer care about anything except our own interests, we are then old, it matters not whether our years be twenty or eighty. It is rejuvenation for the teacher thus growing old, to stand ignorant as a child in the presence of one of the simplest of nature's miracles—the formation of a crystal, the evolution of a butterfly from the caterpillar, the exquisite adjustment of the silken lines in the spider's orb web. I know how to "make magic" for the teacher who is growing old. Let her go out with the youngest pupil and fall on her knees before the miracle of the blossoming violet and say: "Dear Nature, I know naught of the wonders of these, your smallest creatures. Teach me!" And she will suddenly find herself young.

FRED LEMAR CHARLES

DIED AT HIS HOME IN URBANA, ILLINOIS, MAY 6, 1911

It is with deepest regret and sorrow that this announcement is made. Those who were fortunate in knowing Professor Charles keenly feel the personal loss, and those who knew of him through his educational activities, particularly in the cause of nature-study, will miss his leadership.

The American Nature-Study Society owes much to him. He was interested from its beginning as a member and as an officer. As editor of this magazine he made many sacrifices in its behalf. He did not spare himself, but thought only of its success. The measure of this success is known to all its readers.

In behalf of the Council and members of the American Nature-Study Society, I wish to express the sorrow which we all feel, and to extend our heartfelt sympathy to Mrs. Charles in her bereavement.

It seems fitting in this connection to hear expressions of appreciation from some of those with whom he has been personally associated, in order that we may all catch some of the spirit and inspiration that comes from a life so well lived.

B. M. Davis,
President, American Nature-Study Society

Fred Lemar Charles came to the University of Illinois in 1909 as Assistant Professor of Agricultural Education. The work that he was called to undertake was pioneer work of a very difficult type—the organization of educative materials in a very large and comprehensive but almost chaotic field of human experience. The tangible results of his two years' grappling with this problem are far from insignificant. As one of the working members of a committee appointed to draw up a plan for teaching agricultural nature-study he made a lasting contribution to the cause of rural education. In organizing the annual Conference on Agricultural Education, two successful sessions of which have been held, he initiated a movement that will carry his influence far into the future. His skillful planning and executive ability were amply demonstrated in his management of the "school on wheels" which traversed the interurban railroads in central Illi-

nois three months ago, bringing to the boys and girls of the rural schools skillful instruction and effective inspiration. And finally, he elaborated a thoroughly practical plan for demonstration-teaching in the rural schools—a system which, with a relatively small expenditure of money, will mean really effective instruction in elementary agriculture. These achievements represent real and substantial gains to the cause which he served so faithfully and so well.

But there was another side to his life, and there was another type of influence that he exerted over those who knew him well. When a man is in almost constant physical pain; when he feels that he is gradually but surely losing his grip on the threads of life; and when, under this condition, he can clinch his teeth as Charles did, and work on steadfastly while only the great dark looms up before him; when he can mingle with his friends and live in close association with his fellow-workers without once revealing, save perhaps through the indirect expressions that no man can inhibit, the physical and mental torture that he is undergoing; then he has set a standard that deserves the name of achievement if any conquest in this life deserves that name.

Charles was one of the most finely sensitive men that I have ever known. He shrank from anything that could be interpreted even indirectly as an appeal for sympathy. Only once, fully six months before his death, did he tell of his unceasing pain, and that was only in a moment of confidence—just a momentary and casual reference, and then he was back again to the problems that he was trying to solve. It was only in the little things that we can remember now—and particularly in his quick sympathy with the troubles of others, his instant appreciation of their little triumphs—it was in these that we might have read, had we been sufficiently keen, the subjective tragedy through which he was living.

W. C. Bagley,
Director of School of Education, University of Illinois

When organizing the Faculty of the Northern Illinois State Normal School I elected Mr. Fred L. Charles for the department of Biology because of his warm interest in elementary schools. The choice finally lay between him and a man of quite extended scholarship but who was devoted more especially to the higher aspects of science work. Mr. Charles had done considerable

work with groups of grade teachers in Chicago and was working diligently at the nature-study problem. I think that I made no mistake in my choice, for he gave himself enthusiastically to the difficult task of laying out courses in nature-study for the grades in the elementary school.

We were very reluctant to lose Mr. Charles from the institution, and I employed all the arguments at my command in trying to convince him that he was better adapted to the work of the Normal School than to that of the University unless the University should attempt to reach the elementary schools directly.

Mr. Charles made himself very popular in this community as well as in the faculty of which he was a member. He was a public-spirited citizen and lent himself heartily to all schemes for the improvement of our community life and especially when it involved his technical knowledge.

The next number of our school paper will be a memorial edition devoted entirely to him and to his work.

JOHN W. COOK,
President, Northern Ill. State Normal School

Professor Charles came to the University of Illinois to undertake the new and somewhat difficult task of making a plan whereby agriculture could be introduced into the elementary schools without doing violence to well established pedagogical principles. His undertaking was to begin with nature-study in the lower grades, gradually introducing more and more agricultural material, until in the seventh and eighth grades for those interested in country life agriculture should predominate, fitting such students for the election of agricultural courses in the high schools.

Professor Charles brought to his work an intimate knowledge of biological science, a love for nature in all its forms, and a successful experience in the teaching of nature-study in the Northern Illinois State Normal School at DeKalb. He came into his work quietly, but with every evidence of interest and promise of success.

His untimely taking off is not only a sorrow to the friends he made everywhere, but it removes from the field of his specialty one of the most promising men of the country.

E. DAVENPORT,
Dean of College of Agriculture, University of Illinois

NOTES ON PERIODICALS AND BOOKS

School Agriculture, Domestic Science and Manual Training is the title of a four-page semi-monthly text published by the Orange Judd Co. It gives practical suggestions for school work in nature-study-agriculture.

Tree Growing in Public Schools. By E. B. Babcock. Calif. State Exp. Sta. Cir. 59 (1911). Pp. 19.

All the necessary directions for tree growing are clearly given from the standpoint of the public school, and may be readily followed by any teacher. B. M. D.

Massachusetts Agricultural College, Department of Agricultural Education, Circular 10, 1910. In August, 1910, the third annual conference on Agricultural Education was held at Amherst, Massachusetts. Seven of the papers upon school and home gardens are published in this bulletin. The first and last of these papers deal respectively with the place of garden work in education and suggestions as to how the work should be done. All the other articles are descriptions of what has already been accomplished, and because of their direct, concrete statement of actual occurrences in garden work, are of much value. O. W. C.

Elementary Horticulture for California Schools. By Clayton F. Palmer. Los Angeles: State Normal School Bulletin (1910). Pp. 76.

Although written for California conditions, this bulletin has much of interest for other sections of the country. The following subjects are discussed: The School Garden; the Lath-house; Seed-sowing in Boxes; Transplanting; Propagation of Plants; Potting and Repotting of Plants; House Plants; Window Boxes and their Care; The Planting and Care of Bulbs; The Inside Miniature Farmstead; Lawn-making and Care; Ornamental Gardening; Where to Obtain Seeds and Plants; Publications of the U. S. Department of Agriculture. B. M. D.

Agricultural Instruction in the Public High Schools of the United States. By C. H. Robison. New York: Columbia University Press. 1910. Pp. 200.

This book deals with the present status of agricultural education in the schools mentioned in title. Some idea of the thorough treatment of the subjects is indicated by the chapter headings: The Public High School; Some Types of High Schools Teaching Agriculture; Administration, Equipment and Methods; Preparation and Salaries of Teachers of Agriculture in High Schools; Special Secondary Schools of Agriculture; Problems of Agricultural Instruction in the Secondary Schools. Two apendices, one on legislation, the other giving a very complete list of references, are added.

It is impossible in a brief notice to do justice to this book. The author has rendered great service to agricultural education by bringing together an immense amount of valuable data hitherto inaccessible.

B. M. D.

Huxley's Autobiography and Selected Essays. Edited with introduction and notes by Sarah E. Simons. New York, Chicago: D. Appleton and Co. 1910. Pp. 208. Price, 40 cents.

This handy volume, from the series of "Twentieth Century Texts", will be welcomed by all interested in placing the classics of science in the hands of young people. The selections "show how the facts of science

can be made attractive through the method of treatment; they emphasize the necessity for clear exposition in order to impress knowledge". The introduction of Huxley's essays into the course in English should contribute to the popularization of science in the best sense of that term.

F. L. C.

Children's Gardens for Pleasure, Health and Education. By Henry G. Parsons. New York: Sturgis and Walton Co. 1910. Pp. 226.

The author of this book is well known as secretary of the International Children's School Farm League and director of the Department of School Gardens of New York University. With minor exceptions, where terminology might invite challenge, the psychology of the book is good and there are some very good passages concerning ideals. Specific habits are well handled under the topic "The Pedagogy of the Spade". Perhaps the best feature is the definiteness of the directions given for the various steps in the making and care of a garden. It should be stated that the book is treated from the viewpoint of a worker with children in a large city.

F.L.C.

NOTICE TO SUBSCRIBERS OF THE REVIEW AND TO MEMBERS OF THE SOCIETY

The Nature-Study Review will publish its next regular issue in September as usual. The affairs of the Review are in good shape. Arrangements have already been made to take care of the business until a permanent editor is elected. The outlook is very promising. It is desirable, however, that each member make a personal effort to increase the number of subscribers. The more subscribers, the greater possibilities for increasing influence of the Review.

B. M. Davis,
President of A. N.-S. S.

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THE PLACE OF FORESTRY IN GENERAL EDUCATION*

By HERBERT A. SMITH, Forest Service
U. S. Department of Agriculture

The now widely awakened interest in forestry is leading to the introduction of some sort of teaching about it—sometimes as a distinct course either in forestry or in the conservation of natural resources, sometimes as a part of older courses of study—into the curriculum both of schools and of colleges and universities in connection with general as distinguished from vocational education. This has not gone far as yet, but it reaches into every stage of education from the nature-study work of the primary schools to the elective courses of the student approaching his degree. Whether we like it or not, forestry is taking a place in general education. It is important that the teaching of it should be rightly guided and properly coordinated with educational work generally.

I presume that I shall seem, to most of you, to take a strange position when I say that I think forestry a cultural subject. To make clear why I hold this I am going to ask you to let me pass very briefly in review certain recent changes in educational ideals which have been illustrated in the content of secondary education.

As we all know, secondary education has been in a state of more or less confusion during some years. It has lacked certainty both as to what ends it should aim at and what methods it should use. First of all the sciences, with the modern languages as their allies, successfully disputed the exclusive claims of the old classical course studies. This they did largely on the plea of their own superior practical value. We had reached, we were told, a scientific age. The task of education should be to teach us to think scientifically and to conquer the material world.

*Read before the Conference on Education in Forestry, held in Washington, D. C., December 30 and 31, 1909.

The study of the "humanities," the ideal of "culture" in education, gave way before the pedagogic outfit of the laboratory and the experimental method, and before the spirit of investigation in pursuit of objective truth. In short, the new education may be said to have worshipped at the shrine of Science- as-an-end-in-itself.

Presently, however, a new controversy began. In the ranks of the scientists themselves schism arose. While some of them laid main insistence on rigorous training in method, with disciplined scientific thinking and power of independent research as their objective, others held to the belief that the pupil should be taught to know as much as possible about the world with which he comes in actual contact, and that knowledge, and useful knowledge to boot, should be the first aim rather than drill. Pedagogics on the one hand, with its enunciation of the principle that education should begin with the familiar, not the unfamiliar, and should deal with what is real to the pupil, and philosophic thought on the other hand, with its flat denial of the right of science to call its world more than one aspect of reality and its insistence that the vital thing in life is experience, not an abstract from experience,—supported the schismatics. And then came the demands of vocational education. The outcome was the pretty complete discomfiture of the party which would have turned our high schools into incubators of fledgling scientists, trained in methods of research and thirsting for scientific discovery for pure love of truth. There is no great crowd of pedagogues now who worship at the shrine of Science-as-an-end-in-itself.

Culture, disciplined scientific power, useful knowledge, economic efficiency—all these educational ideals aim primarily at the good of the individual. And, as a rule, the education which aims at them is not likely to consider moral training an integral part of its work. But our system of public education at public expense justifies itself only on the ground that the education given serve the public welfare; and this again leads naturally, if not inevitably, to the conclusion that at least one purpose of such education should be to train in good citizenship. Surely this kind of education means moral education.

Now I am ready to begin to build up my argument for the right of forestry to a place in general education.

Dr. C. F. Hodge of Clark University published a little pamphlet a few months ago under the title of "Civic Biology."

This somewhat cryptic title stands for a conception of the function of scientific teaching, and of education generally, fundamentally different from the conceptions ordinarily held. His conception is, I think, well worth my bringing to the attention of this conference.

In a word, he holds that the school teaching of biology should be not only practical, as distinguished from purely scientific, but also civic, as distinguished from merely economic. "Civic biology" is neither biology taught in order to broaden out the mind to a well-rounded intelligence, nor biology which seeks knowledge of the laws of life as an end in itself, nor biology which seeks to instruct the individual concerning the life history of such organisms as are likely to affect his personal welfare, nor biology adapted to the service of some special occupation—but biology applied to community interests. Necessarily such a treatment of any branch of ordered knowledge is rooted not in science but in morals. Every conclusion is an ethical one. By providing nesting-places and putting food for birds we increase the yield of fruit in our neighborhood. By cutting noxious weeds at the proper season we help control a pest. By cleaning up the breeding-places of mosquitoes and flies we improve the public health. How much better it is, thinks Professor Hodge, to aim in our teaching of biology at good citizenship than at individual attainment or advantage for the final result.

But in one respect I should modify Professor Hodge's idea. "Civil biology" seems to me a somewhat too restricted term. I should substitute for it another, first suggested by my colleague, Mr. Cleveland—civic geography.

Almost exactly a year ago I attended some of the meetings of the Association of American Geographers, held as a part of the Baltimore meeting of the National Association for the Advancement of Science. I went there primarily because they wished to learn something about what the Forest Service is doing with the National Forests. The very fact that they wished such a paper to have a place on their program is significant. I do not know how many of you have observed what ground the subject of geography now covers, or what its development as a subject of instruction has been. Certainly it is very different from what it was in the days of my own school and college education.

I remember very vividly with what surprise I learned from one of my friends just returned from his graduate studies abroad,

some fifteen years ago, that geography was held in the German higher institutions of learning to be a subject deserving of separate university chairs and courses. Shortly after that our own universities began to take up the subject. First, I think, came commercial geography. Now it is hard to say what has not come in. The general impression which I gathered from reading the program of the Baltimore meeting and from the papers which I heard there was that the field of geography includes the greater part of human knowledge, and perhaps the greater part of what is now human ignorance; and that biology, botany, zoology, geology, history, economics, and I know not how many other subjects, have surrendered their independent standing and are now no more than side shows to the main educational performance run by the geographers.

Very likely you know that the geographers make much of what they call "geographic controls." Human history and human institutions, they point out, are largely the result of environmental influences. The locations of great cities are, of course, determined by natural causes; the alternation of growing and non-growing seasons, with the subsequent need for a stored food supply, has doubtless played an important part in the development of property rights. To the study of these geographic controls of man geographic science is now giving a great amount of attention.

But there is a geographic control by man as well as a geographic control of man. Human life causes geographic phenomena as well as displays them. When wolves are driven from their native habitat, or erosion from a great mountain region is accelerated, or soil fertility is reduced, or an improved variety of wheat is bred, man becomes the control.

In the past man's conquest of nature—in other words, man's advance in material civilization—has been mainly that of the individual seeking his own betterment through the excercise of intelligence to make nature serve his own ends. But a still larger exercise of intelligence is possible if men will seek to shape their collective action along the lines that will make the earth most habitable and most responsive to human needs. Here is the same underlying idea which Professor Hodge's pamphlet presents. You will see now why I think "civic geography" a better term than his.

Already several of our universities are giving courses in conservation. At Yale such a course is given by one of the

professors of economics. What department it is regarded as falling under is, to my mind, relatively unimportant. But surely it is important that our students who are preparing for life and for citizenship, whether that preparation is in the college course on in the high school course, should at least have the chance to find out how different possible courses in our use of forests and of other natural resources will affect the public welfare. I think myself this is putting it far too mildly. I have already said that I believe a proper preparation for citizenship necessarily involves training to the right attitude on these questions. If this is true it is the business of education—secondary education and higher education—to give the training.

And it must be a *moral* training. It must recognize and make clear the duty of the individual, and the responsibility that rests upon the community in matters of public welfare, as well as the effect on the public welfare of certain courses of action. The fact is that our ethics have not caught up with the situation. Old conceptions encumber the path. There is much that has not yet been thought out clearly. Yet with the rising tide of national consciousness, with the awakening of public conscience, with the demand for the moralization of business, with the growing appeal of ideals, interest in humanity, and eagerness for service that seems to be taking hold upon our people, and especially upon our young people, may we not believe that a new forward movement in civilization is possible? May we not believe that the public welfare is to be sought as never before through collective action in man's relation to the earth upon which he lives?

Now I do not believe that forestry, as such, should necessarily be made a separate course, either in schools or in colleges. But I do believe that from the first stages up—from the nature-study in the lowest grades to the courses of the university—provision should be made for teaching the conceptions which are really involved in forestry and which we have reached as a result of our National Forest work. And I believe it is the duty of those who are engaged in the work of forestry education to do everything that they can both to put into pedagogic form the material which forestry furnishes and to promote the introduction of courses which shall give the general student what I hope you will let me call, with a right understanding of what I mean, the cultural—that is the whole-man-developing value of forestry.

FORESTRY FROM TWO VIEWPOINTS

By J. J. CRUMLEY, Ohio State Experiment Station, Wooster, Ohio

It would be difficult to find a subject that attracts the attention of as great a variety of people as does forestry. First, there is the plain farmer who owns a hundred or more acres of land, and has located on that area a small wood-lot; or perhaps has no trees and therefore feels very keenly the need of such and is endeavoring to start a grove. Then there is the large land owner or a company of men having large holdings that contain a large percentage of waste lands. These men are beginning to observe that such lands are bringing no income. They wish to know how they may change these from non-producing to producing lands. Again, there is the owner of a beautiful piece of real estate on some village or city street. This piece of property may possess a row of handsome shade trees that need care and protection from the elements, animals and man, or perhaps the lot is entirely bare as far as trees are concerned.

These people, following entirely different pursuits in life, differing very widely in their individual tastes, are all interested in the culture and care of trees. This may in a measure come about by the fact that forestry has two phases totally different—the economic, and the aesthetic or sentimental.

A certain farmer owned a woodland that contained some valuable oak timber. He sold this to a lumberman. In that woodland was also a walnut tree having a large hollow in it near the ground. The lumberman crawled into this hole and discovered that it extended but a short distance up the tree. The farmer had never done this. The lumberman bought the old "hollow" tree for five dollars, sawed it into veneering which he sold for four hundred and fifty dollars.

Land owners in Ohio today are selling the few remaining majestic yellow polar trees at twenty to thirty dollars per thousand on the stump. Twelve or fifteen dollars per thousand will take the trees from the woods and convert them into lumber. This added to the orginal stumpage price makes, let us say, forty dollars per thousand. If the land owner wishes to buy some of this lumber he pays from sixty to eighty dollars per thousand for it. Who gets the other twenty to forty dollars ?

Two men living in adjoining neighborhoods in 1910 were selling white oak logs to a lumberman in a neighboring town. One received twenty dollars per thousand for logs thirty inches

in diameter, the other received forty-five dollars for logs of the same size, both first grade logs and sold to the same man.

Six years ago a certain land owner in Ohio had a steep hillside which was fertile, and covered with a dense stand of walnut trees ten inches in diameter with trunks thirty to fifty feet long. He desired to plant strawberries in the rich soil where these trees stood, and gave the trees to a neighbor for taking them off the ground. The plot is today abandonded and given over to gullies and a few briers and weeds and is an eyesore to the farm.

A little attention, a little care exercised in discriminating, a few items of information about the habits and requirements of some of our most common trees, would save thousands of dollars annually to the land owners of our state (Ohio).

Much has been said and written during the last few years about the study of literature. It seems to me that if we expect to understand, appreciate and enjoy our American authors we must have a good acquaintaince with the trees. Nearly all of these authors lived very close to nature and frequently mention trees or something connected with them.

Hundreds of illustrations could be found in support of this statement. The following quotation is typical:

"This is the forest primeval, the murmuring pines and the hemlocks,
Bearded with moss and in garlands green, indistinct in the twilight,
Stand like Druids of old, with voices sad and prophetic....."

Why did the author say murmuring pines? Would it have been just as fitting for him to have said murmuring oaks or maples, or to have spoken of the rustling leaves in the pine forest? To appreciate this piece of literature we must have some acquaintance with the pine trees or other conifers. In the introductory nineteen lines of this poem the author mentions trees ten times and frequent references are made to the forests or some individual tree throughout the poem.

Longfellow is no exception. All poets seem to have been inspired when brought face to face with a majestic tree or plunged into the depths of the forest. There is a certain feeling of admiration, of pleasure, of awe, or of quiet repose that unconsciously comes over us when we come into the presence of

some giant tree or walk in the midst of some magnificent forest in its virgin state, and we do not have to be poets to possess these feelings.

The writers of ancient times likewise seem to have had a love for the trees and made frequent references to them. The Bible is a good example of this. A knowledge of the trees will sometimes aid us in the interpretation of a passage in classical literature; for example, Vergil's Aeneid, Book III, line 6799, which ends with the words *vertice selso*. There are several lines in the sentence, and for the Latin the reader is referred to the Aeneid. Translated into English it should read "We perceived the Aetnean brothers....raising their lofty heads to the sky, such as when stately oaks or cone-bearing cypress trees stand together with *lofty top,* (*vertice celso*). The editors and commentators on Vergil interpret *vertice celso* here to mean a high mountain top. Again, this interpretation destroys and makes ridiculous a beautiful simile as it came from Vergil's hands. Trees, if there be any on the summit of a lofty mountain, are little dwarf-like specimens of their kind, mere shrubs. According to the common interpretation, Vergil is comparing this mythical race of giants, one of whom uses the trunk of a tree for a walking stick, to these drawfed specimens of trees. Such an interpretation is not only absurd but a reflection on this country poet's knowledge of nature.

FORESTRY IN NATURE STUDY*

By EDWIN R. JACKSON, Expert, Forest Service, U. S. Department of Agriculture

It is not so long ago that educators who advocated the teaching of nature-study did so with timidity, and, perhaps, even apology, fearing the criticism that inevitably is his who presumes to add a new burden to the work of the public school teacher. But today we speak of nature-study as something that has arrived. It is no longer an experiment, but its status is well recognized, and its benefits have become so apparent that now there is seldom a voice raised in opposition to its advocacy.

These facts illustrate the trend of modern education. The significant tendencies of education today appear to be to teach from *things* rather than from books; to give the pupil a mastery of useful facts, or what may be termed "the vocational aim"; and to appeal to the interests of the pupil rather than to aim at mental discipline alone. In other words, the cry of the schoolmaster today is for "practical education"—education not only practical in its results, but practical in its methods. We are no longer content to read mere facts from books when the things upon which these facts are based can be seen first-hand out-of-doors, or can be brought before the student in the classroom by means of specimens or pictures. We are no longer satisfied with mere "drills" formerly so prevalent under the delusion that the grind of keeping the mind busy along *one* line of thought will develop keenness of perception and soundness of judgment along *all* lines. We have come to realize that keenness of perception can best be acquired by practice in observation and that the way to develop judgment is to put the judgment to the test. So, in line with these tendencies, we encourage the study of nature in the elementary grades of our schools.

Dr. G. Stanley Hall has said, "To know nature and man is the sum of earthly knowledge." It is the work of the nature-study teacher to acquaint the pupil with secrets of nature and start him on the road to a mastery of his surroundings. The field of nature-study is an exceedingly broad one. The various phases of nature which invite research are almost limitless. Among all these possibilities it becomes the duty of the teacher to select for study those natural phenomena that are most worth

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*Address delivered at the Summer School of the University of Virginia, June, 1911.

while. In making this selection the teacher should be guided by the accessibility, suitability, and the practical importance of the subjects available. Nowhere in the world of nature is there anything which more often meets all these tests than the forest, and for this reason, forestry, in its more elementary phases, is of interest to the teacher of nature-study.

It will be well to keep in mind, however, the distinction between forestry and "tree-study" as commonly found in the nature-study courses. These "tree-studies" usually consider only the individual tree. Forestry concerns itself very little with the individual tree, but considers, chiefly, trees as they grow together on some tract of land whose principal crop they form. Tree studies have long been favorite excersises for nature-study classes, but it is seldom that the forest has been studied, in spite of the fact that the forest has a story quite different from that of the single tree. The teacher who confines the observations of her class to the habits or features of individual trees, misses a great opportunity, for the forest has a life history so varied and fascinating that it cannot fail to interest the pupils.

Another distinction between forestry and tree study lies in the fact that forestry is, as a rule, economic in its aims, rather than aesthetic. It seeks to make forests serve whatever ends the owners may have in view; and generally these ends are utilitarian. The work of the forester is usually to make of the forest a paying crop. He does not, except in special cases, pay much attention to the beauty of the trees or their preservation merely for their effect on the landscape. He seeks to preserve forests either as a means of insuring a supply of wood, or because they serve to protect the soil from erosion on steep slopes or to regulate the flow of streams. The forester has no great degree of sympathy for the sentimentalists who would put a stop to all tree cutting because of the beauty of the trees or because of fond memories associated with them. His aims and ideals are generally those of cold utility, and his only restriction on tree cutting would be that it be not done wastefully or wantonly or so as to curtail the future supply of timber.

Where, then, in the work of the nature-study classes, is there room for such a practical, scientific subject as forestry? It would be manifestly unwise to attempt to teach forestry, as such, to children in the grades. Even in the high school only the most elementary principles can be taught. Nevertheless, a great many of the general principles upon which forestry is

based can be brought within the comprehension of young children. But, clearly, to begin with, the pupil in the lower grades should be made familiar with the life history of the trees and the nature of tree growth.

Perhaps the first step in this direction should be the identification of our common trees. However, I do not believe this should be done by means of botanical analysis or with the aid of a "key" based on botanical or structural features of leaves or other parts of the tree. The young child is incapable of distinguishing morphological features, and scientific accuracy is not to be expected of him. Much better results will be accomplished if the child is simply led to know the trees just as he knows his friends—by their forms, features, and general appearance, without even being able, perhaps, to tell as yet *how* he knows them. That will come later. For example, a child will soon become able to sort out a pile of leaves placed before him and say, "This is a maple leaf", or, "This is an oak leaf," even though he is unable to tell how to identify such leaves by their veinings or marginal features.

The pupils should also learn some of the simple facts as to the life processes of the tree. He should know, for example, that the tree gets its food through its roots and its leaves from the soil and the air; that this food is prepared in the leaves by the aid of the sunlight; and how the tree grows in girth by adding ring upon ring of wood cells to its trunk and branches, and in height, not by lifting its whole trunk and crown, as often believed, but rather by adding on to the tips of its twigs. There are numerous fallacious beliefs about tree growth common to children that should be corrected in the minds of all public school pupils—such for example, as the idea that the brilliant colors of the autumn are due to frosts; that girdling a tree checks the rising current of crude sap in its ascent to the leaves; and that the leaves never fall from evergreens.

Then, too, there are some wonderful stories to be told about the trees; how they scatter their seeds, for instance, or how they battle with one another in the forest, each one struggling for the best position, like people in a crowd jostling one another to get sight of some common attraction before them.

Another feature of the forest which should be brought out, and which can easily be made interesting to children, is the usefulness of the forest to mankind. The story of a log, from forest to furniture or from tree trunk to toothpicks, through all

the stages of manufacture, is full of interesting incidents. This story, written up by the pupils in a "forest booklet," illustrated by drawings or pictures cut from papers or magazines, forms a splendid exercise in composition. This booklet can be amplified by an appendix containing lists of useful household articles and food or medicinal products obtained from trees. Likewise, each of these products has its own story, and the class can vary its lessons on the usefulness of the forest by having several of these "stories" written up by members of the class.

Besides its commercial importance, the forest is useful to man because of its protective influence. "What trees do for us" forms another interesting topic for an essay, in which might be included discussions of how the trees furnish shade for us and shelter our homes from storms and winds; how they hold the soil on forest-covered hillsides, thus preventing erosion; how they enrich the soil on the forest floor each year by a layer of humus formed from their fallen leaves; and how these leaves protect the roots and seeds of plants through the winter, covering the ground like a blanket to shield them from frost.

It is impossible, in the short space allowed in this paper, to suggest all the different lines along which these studies might be pursued, but a publication entitled "Forestry in Nature Study," now being prepared by the Forest Service, will contain detailed suggestions for such work, adapted for the various grades and arranged by seasons. This publication will soon be available for free distribution to teachers. If a request is directed to The Forester, Washington, D. C., a copy will be sent to any person interested as soon as the bulletin becomes available.

Of course, the great question with the teacher is always "How shall I teach these things?" There are no elementary text-books to be used, and we are so accustomed to depend upon the text-book that most of us are well nigh helpless without one. The good teacher, however, never lets the text-book interfere with her teaching, and fortunately, for the study of the forest, no book is necessary, since all the material necessary can be had first-hand everywhere.

One of the best ways to secure material for study and at the same time to increase the interest of the pupils, is to start a school "forest museum," containing samples of forest products, collections of woods, and other materials derived from the forest. It is essential, however, for the greatest success of such a museum, that the material collected be used for something more than

merely show purposes. Children soon lose interest in blocks of wood or other objects shut up in glass cases or protected by the warning sign of "Hands Off!" As far as possible, the specimens should be so arranged that they can be handled and passed about from pupil to pupil without injury. The children should be encouraged to feel that the museum is their own property to use and examine as freely as they desire,—of course, under such reasonable limitations as may be necessary for the discipline of the school.

Field trips are another essential to the best success of forest studies, but field excursions should never be undertaken until the interest and co-operation of the pupils have been secured. The pupils should first be brought to the attitude of looking upon the field work as a part of their regular lessons as much as a blackboard exercise in numbers or map-drawing. The trip must be carefully planned, and the person who is to have charge should be thoroughly familiar with the ground to be covered and well informed as to the things of interest about the trees that are to be brought to the observation of the pupils. Finally, the trip should have a definite aim. An aimless trip will almost surely be a disastrous one. Some definite undertaking should be assigned to the pupils, and some sort of written or oral report required of each one. This cannot be too strongly emphasized.

As a final suggestion by which I believe the study of forestry can be made useful, I wish to suggest the possibility of devoting a part of the school garden to a tree nursery, in which trees may be grown from seed, just as vegetables and flowers are ordinarily grown. Scarcely any more work will be required for the nursery than for the ordinary garden, and the trees will form a much more permanent product which can be utilized for the beautification of the school grounds or the lawns about the homes of the children.*

In all the work with the trees and the forest, the teacher has an opportunity to impress upon the minds of the children a lesson which should be thoroughly learned by every young citizen, which is that the forest is a very important contributor to our national wealth and one of the chief reasons why our nation is so prosperous is because we have been bountifully sup-

*Full direction for the establishment and maintenance of a school nursery will be found in Farmers' Bulletin 423, U. S. Dept. of Agriculture, "Forest Nurseries for Schools."

plied by nature with timber. Hence it is the duty of every citizen to see that this great national heritage is not wasted or wantonly destroyed. Our public school pupils, who are our future citizens, should be taught this lesson of national thrift, just as they should be taught personal thrift by their parents.

A LIST OF BOOKS AND PERIODICALS ON TREES, FORESTRY AND CONSERVATION

Compiled for the Nature-Study Review by the Forest Service, U. S. Department of Agriculture

Tree Books

Apgar, Trees of the Northern U. S. American Book Co., N. Y. $1.

Brisbin, Trees and Tree Planting. Harper & Bros., N. Y. $1.50.

Britton, Trees. Henry Holt & Co., New York. $7.

Chase, Cone-Bearing Trees of the California Mountains. A. C. McClurg & Co., Chicago. $.75.

Collins & Preston, Key to New England Trees. Preston & Rounds Co., Providence, R. I.

Dame & Brooks, Handbook of Trees of New England. Ginn & Co., Boston and Chicago. $1.50.

Emerson & Weed, Our Trees and How to Know Them. J. B. Lippincott & Co., Philadelphia. $3.

Flagg, A Year Among Trees. Educational Pub. Co., Boston. $1.

Going, With the Trees. Baker & Taylor Co., N. Y. $1.

Hough, Handbook of the Trees of the Northern United States and Canada. Harper & Bros., New York. $8.

Huntington, A Study of the Trees in Winter. Knight and Millet, Boston. $2.25.

Jepson, Trees of California. Cunningham, Curtis & Welch, San Francisco. $2.50.

Keeler, Our Native Trees. Chas. Scribner's Sons, N. Y. $2.

Lounsberry, Guide to the Trees. Frederick A. Stokes & Co., N. Y. $1.75.

Maury, The Native Trees of Kentucky. (Kentucky Fed. of Women's Clubs)

Mathews, Familiar Trees and Their Leaves. D. Appleton & Co., New York. $1.75.

McFarland, Getting Acquainted with the Trees. Macmillan Co., New York. $1.50.

Mosher, Fruit and Nut Trees. C. W. Bardeen, Syracuse, N. Y. $2.

Mosher, Our Cone-Bearing Trees. C. W. Bardeen, Syracuse, N. Y. $2.

Mosher, Oaks and Maples. C. W. Bardeen, Syracuse, N. Y. $2.

Newhall, The Trees of Northeastern America. G. P. Putnam's Sons, New York. $1.75.

Rogers, Among Green Trees. A. W. Mumford, Chicago.

Rogers, The Tree Book. Doubleday, Page & Co., N. Y. $4.

Rogers, Trees Every Child Should Know. Doubleday, Page & Co., New York. $1.20.

Sargent, Manual of Trees of North America. Houghton, Mifflin & Co., New York. $6.

Park and Street Trees

Fernow, The Care of the Trees in Lawn, Street, and Park. Henry Holt & Co., New York. $2.

Solotaroff, Shade Trees in Towns and Cities. John Wiley & Sons, New York. $3.

Arbor Day Manuals

Kellog, How to Celebrate Arbor Day. A. Flannagan Co., Chicago. 25 cents.

Schauffler, Arbor Day. Moffat, Yard & Co., New York. $1.

Skinner, Arbor Day Manual. C. W. Bardeen, Syracuse, N. Y. $2.50.

General Forestry

Bruncken, North American Forests & Forestry. G. P. Putnam's Sons, New York. $2.

Fernow, Economics of Forestry. T. Y. Crowell & Co., N. Y. $1.50.

Fernow, A Brief History of Forestry. Uni. of Toronto Press, Toronto, Canada. $2.50.

Gifford, Practical Forestry. D. Appleton & Co., N. Y. $1.50.

Graves, The Principles of Handling Woodlands. J. Wiley & Sons, New York. $1.50.

Green, Principles of American Forestry. J. Wiley & Sons., New York. $1.50.

Roth, A First Book of Forestry. Ginn & Co., Boston. $1.75.

Schwappach, Forestry. The Macmillan Co., New York. 40 cents.

Wood Structures and Woodworking

Boulger, Wood. Longmans, Green & Co., New York. $4.25.

Foster, Elementary Woodworking. Ginn & Co., Boston. 60 cents.

Hough, The American Woods (Contains thin sections of various species of woods). Pub. by author, Lowville, N. Y., 10 vols. at $5 each, $50.

Snow, Principal Species of Wood. J. Wiley & Sons, N. Y. $3.50.

Conservation

Cronau, Our Wasteful Nation. Mitchell Kennerley, N. Y.

Gregory, Checking the Waste. Bobbs-Merrill Co., Indianapolis, Ind.

Mathews, The Conservation of Water. Small, Maynard & Co.

Pinchot, The Fight for Conservation. Doubleday, Page & Co., New York. 75 cents.

Tucker, Handbook of Conservation. (Mass. State Fed. of Women's Clubs). Geo. H. Ellis Co., 272 Congress St., Boston.

Schwartz, Forest Trees and Forest Scenery. The Grafton Press, New York. $1.

Van Hise, The Conservation of Natural Resources in the United States. The Macmillan Co., New York.

American Conservation (Organ of National Conservation Association). Monthly, $2 per year.

Forestry Periodicals

American Forestry, (Formerly "The Forester"; "Forestry and Irrigation"; and "Conservation") (Organ of American Forestry Association). Washington, D. C. $2.00

Forest, Fish, & Game, (Formerly Southern Woodlands) (Organ of Georgia Forest Assoc.) Athens, Ga. 1.00

Forest Leaves, (Organ of Pa. Forestry Assoc.) Philadelphia, Pa. 1.00

Forestry Quarterly, (Technical) Boston, Mass. 2.00

Hawaiian Forester & Agriculturist, (Issued under the direction of the Board of Commissioners of Agriculture and Forestry) Honolulu, H. T. 1.00

Michigan Roads & Forests, (Organ of Michigan Road 1.00

Makers' Association and Michigan Forestry Association)
Detroit, Mich.

Minnesota Forester, (Organ of Minn. Forestry Assoc.) $1.00
St. Anthony Park, Minn.

Ohio Forester, (Organ of Ohio Forestry Assoc.) .25
Wooster, Ohio.

Oregon Forester, (Organ of Oregon Forestry Assoc.) 1.00
Portland, Oregon.

Woodland & Roadside, (Organ of Mass. Forestry Assoc.) .25
Boston, Mass.

Water & Forest, (Organ of Cal. Water & Forest Assoc.) .50
San Francisco, Cal.

Proceedings of Society of American Foresters, 50c per mo.
(Technical)
Washington, D. C.

Proceedings of Connecticut Forestry Assoc., price not given
New Haven, Conn.

Proceedings of the Iowa Park & Forestry Assoc., price not given
Iowa City, Iowa.

Reports of Society for the Protection of New Hampshire Forests, price not given
Concord, N. H.

Miscellaneous Leaflets on Tree Study

Babcock & Greene, Tree Growing in the Public Schools. Circular 59, Agric. Experiment Sta., Univ. of California, Berkley, Cal.

Fox, Tree Planting on Streets and Highways. Forest, Fish & Game Commission, Albany, N. Y.

Goetz, Our Cone Bearers and Evergreens. Extension Bulletin, Dec. 1910, Agric. College, Ohio State Univ., Columbus, Ohio.

Lazenby, How to Know Some Ohio Trees. Extension Bulletin, Nov. 1910, Agric. College, Ohio State Univ., Columbus, Ohio.

Lazenby, What Trees Do. Extension Bulletin, Oct. 1908, Agri. College, Ohio State Univ., Columbus, Ohio.

Weed and Rane, The Evergreens. (Issued by State Forester of Mass., Boston).

Weed and Rane, The Study of Trees in Our Primary Schools. (Issued by State Forester of Mass., Boston).

U. S. DEPARTMENT OF AGRICULTURE

Publications of the Forest Service Suitable for Educational Use

Single copies of any of the publications listed, *except those starred* (*) may be obtained free while the supply lasts. Requests should be addressed to The Forester, U. S. Department of Agriculture, Washington, D. C.

All publications listed, *including those starred* (*), may be purchased *in any quantity* from the Superintendent of Documents, Government Printing Office, Washington, D. C., at the prices indicated on this list. Remittance should be made by postal money order or bank draft (New York exchange). Stamps not accepted. Coin is sent at sender's risk.

Farmer's Bulletins (Price, 5 cents each)

134. Tree Planting on Rural School Grounds.
173. A Primer of Forestry, Part I.
228. Forest Planting and Farm Management.
252. Maple Sugar and Sirup.
341. The Basket Willow. . .
358. A Primer of Forestry, Part II.
387. The Preservative Treatment of Farm Timbers.
423. Forest Nurseries for Schools.

Bulletins

*10. Timber: An Elementary Discussion of the Characteristics and Properties of Wood. 10c.
*17. A Check List of the Forest Trees of the United States. 15c.
*28. A Short Account of the Big Trees of California. 15c.
*34. A History of the Lumber Industry in the State of New York. 20c.
*42. The Woodlot. 15c.
*65. Advice for Forest Planters in Oklahoma and Adjacent Regions. 5c.
*76. How to Grow and Plant Conifers in the Northeastern States. 5c.
78. Wood Preservation in the United States. 10c.
82. Protection of Forests from Fire. 15c.
83. The Forest Resources of the World.

Circulars (Price, 5 cents each)

23. Suggestions to Prospective Forest Students.
37. Forest Planting in the Sand-Hill Regions of Nebraska.
41. Forest Planting on the Coal Lands of Western Pennsylvania.
45. Forest Planting in Eastern Nebraska.
54. How to Cultivate and Care for Forest Plantations on the Semi-Arid Plains.
55. How to Pack and Ship Young Forest Trees.
61. How to Transplant Forest Trees.
81. Forest Planting in Illinois.
96. Arbor Day.
99. Suggestions for Forest Planting on the Semi-Arid Plains.
100. Suggestions for Forest Planting in the Northeastern and Lake States.
114. Wood Distillation.
116. The Waning Hardwood Supply.
130. Forestry in the Public Schools.
138. Suggestions to Woodlot Owners in the Ohio Valley Regions.
140. What Forestry Has Done.
145. Forest Planting on the Northern Prairies.
154. Native and Planted Timber of Iowa.
161. Forest Planting in Western Kansas.
165. Practical Assistance to Owners of Forest Lands and to Tree Planters.
*166. The Timber Supply of the United States.
167. The Status of Forestry in the United States.
168. The Commercial Importance of the White Mountain Forests.
171. The Forests of the United States; Their Use.
176. Surface Conditions and Streamflow.
181. The Consumption of Firewood in the United States.

Yearbook Extracts (Price, 5 cents each)

249. A Working Plan for Southern Hardwoods and Its Results.
329. The Relation of Forests to Streamflow.
376. How to Grow Young Trees for Forest Planting.
398. Waste in Logging Southern Yellow Pine.

466. Cutting Timber on the National Forests and Providing for a Future Supply.
517. Forest Planting for the Farmer.

Unnumbered Publications

Information Regarding Employment on the National Forests. 5c.
Annual Reports of the Forester. 5c.
The Use of the National Forests (Cloth). 25c.
Special Circular, Forestry in Nature Study. 5c.

Maps

Index Map of National Forests (21″ by 33″, paper).
Natural Forest Regions of North America, and Their Characteristic Tree Growth (14″ by 18″, paper).

Census Bulletin

10. Forest Products of the United States, 1907.

Silvical Leaflets

1. Alpine Fir
2. Port Orford Cedar
3. Englemann Spruce
4. White Fir
5. Lowland Fir
6. Sitka Spruce
7. Noble Fir
8. Red Fir
9. Incense Cedar
10. Big Cone Spruce
11. Giant Arborvitae
12. Yellow Cedar
13. Western White Pine
14. Western Larch
15. White Spruce
16. Single Leaf Pinon
17. Four Leaf Pinon
18. Redwood
19. Big Tree
20. Weeping Spruce
21. Jeffery Pine
22. Amabilis Fir
23. Bristlecone Pine
24. Bristlecone Fir
25. Cottonwood
26. Foxtail Pine
27. Torrey Pine
28. Black Spruce
29. Blue Spruce
30. Cal. Swamp Pine
31. Black Hemlock
32. Tamarack
33. Digger Pine
34. Coulter Pine
35. Alpine Larch
36. Knobcone Pine
37. White Bark Pine
38. Paper Birch
39. Monterey Pine
40. Swamp Cottonwood
41. Chestnut Oak
42. Sugar Maple

43. Norway Pine
44. Jack Pine
46. Limber Pine
47. Pinon Pine
48. Pignut Hickory
49. Shagbark Hickory
50. Shellbark or Kingnut Hickory

Planting Leaflets

60. Red Pine
62. Shagbark Hickory
63. Basswood
64. Black Locust
66. White Elm
67. White Pine
68. Scotch Pine
70. European Larch
71. Chestnut
72. West. Yel. Pine
74. Honey Locust
75. Hackberry
76. Silver Maple
83. Russian Mulberry
85. Slippery Elm
86. Box Elder
87. White Willow
88. Black Walnut
89. Tamarack
90. Osage Orange
91. Coffee-tree
92. Green Ash
93. Yellow Poplar
94. Black Cherry
95. Sugar Maple
106. White Oak
182. Shortleaf Pine
183. Loblolly Pine

NATURE-STUDY AT THE SAN FRANCISCO MEETING OF THE N. E A.

By C. A. STEBBINS, University of California, Berkeley, California

The American Nature-Study Society and the American Gardening Association met with The Department of Rural and Agricultural Education in joint session in San Francisco and Berkeley during the N. E. A.

The program for the week was as follows:

DEPARTMENT OF RURAL AND AGRICULTURAL EDUCATION
Sessions in Temple Beth Israel.

Pres. . . . James A. Barr, Supt. of Schools Stockton, Calif.
V.-Pres. Benjamin M. Davis, Miami University Oxford, Ohio.
Sec'y. . . E. E. Balcomb, R. I. Normal School Providence, R.I.

Local Committee: Miss Louisa McDermott, Chairman: Mrs. McGrath, Miss M. Magner.

TUESDAY FORENOON, JULY 11, 9:30 O'CLOCK

Joint Session with the American Nature-Study Society and the School Garden Association of America.

Agricultural Nature Study,—J. B. Lillard, Principal, Gardena High School, Los Angles, Calif.

Discussion: E. D. Ressler, Professor of Industrial Pedagogy, Oregon Agricultural College, Corvallis, Oregon.

School Gardening in Hawaii,—Vaughn MacCaughey, College of Hawaii, Honolulu, Hawaii.

The Potentiality of the School Garden,—Cyril A. Stebbins, Department of Agricultural Education, University of California, Berkeley, Calif.

Report of Committee on a Course of Study in Agriculture,—E. C. Bishop, Department of Agricultural Extension, State Agricultural College, Ames, Iowa, Chairman.

Business: Appointment of Committees.

THURSDAY FORENOON, JULY 13, 9:30 O'CLOCK

Joint Session with the Department of Normal Schools and the Department of Physical Education.

Agriculture and Domestic Science in High Schools with Special Reference to Community Work.—E. T. Fairchild, State Superintendent of Public Instruction, Topeka, Kansas.

Agriculture and Domestic Science in Normal Schools with Special Reference to Preparing Teachers for Community Work—John R. Kirk, President, State Normal School, Kirksville, Mo.

Discussion: Riley O. Johnson, State Normal School, Chico, Calif.; Susan B. Sipe, Washington Normal School, Washington, D. C.

Physical Education in Elementary Rural Schools—L. R. Alderman, State Superintendent of Public Instruction, Salem, Oregon.

Discussion: Edwin L. Holton, Professor of Rural Education, State Agricultural College, Manhattan, Kansas.

Business: Election of Officers.

THE SCHOOL GARDEN ASSOCIATION OF AMERICA

Sessions in Temple Beth Israel.

C. A. Stebbins, Berkeley, Acting Chairman.

J. A. Imrie, Berkeley, Acting Secretary.

TUESDAY FORENOON, JULY 11, 9:30 O'CLOCK

Illustrated Lecture—The Civil Aspect of School Gardens—Louise Klein Miller, Curator of School Gardens, Cleveland, Ohio.

The Child's Home Garden in its Relation to the School Garden—E. C. Bishop, State Agricultural College, Ames, Iowa.

The School Garden as a Center for Nature-Study—Riley O. Johnson, State Normal School, Chico, California.

Business Meeting.

FRIDAY AFTERNOON, JULY 14, 2:30 O'CLOCK

Professor Babcock, Chairman.

Growing Children in California School Gardens—Cyril A. Stebbins, University of California, Berkeley, California.

Illustrated Lecture—School Gardening a Fundamental Element in Education—B. J. Horchem, Principal of "Park Life", Dubuque, Iowa.

Illustrated Lecture—Susan B. Sipe, Washington Normal School, Washington, D. C.

Illustrated Lecture—The Civil Aspect of School Gardens—Louise Klein Miller, Curator of School Gardens, Cleveland, Ohio.

Business Meeting.

During the sessions several hundred people were in attendance.

The morning of July 12th was spent in visiting the gardens on the campus of the University of California and the Le Conte School gardens, following a visit on the previous day to the gardens of the Sutro and Parental Schools of San Francisco. The campus gardens were somewhat depleted having been drawn upon for vegetables and flowers to supply the tables for the luncheon given in Hearst Hall.

The California Junior Gardeners grew the vegetables and flowers and at the luncheon prepared and served the same. Some 200 guests sat down to prettily decorated tables. The menu cards were radishes, turnips, and carrots done in water colors and cut from heavy paper. Within each card the children had printed the menu,—

Sliced Tomatoes
Radishes
Roast Lamb—Jelly
New Potatoes—Creamed Peas
Junior Gardener Medley
Ice Cream—Wafers
Iced Tea Coffee

The menu cards were the product of the Whittier School children of Berkeley. Individual cornucopias made by the children and filled with sweet peas were given to the visitors.

An orchestra composed of children from the Franklin and the San Leandro schools, under the leadership of Miss Bolsted assisted by Mr. C. Way, entertained from a wilderness of palms.

Mr. Stebbins, chairman of the local committee in the absence of President Van Evire Kilpatrick, introduced Professor Babcock of the University of California as toastmaster. Professor Caldwell, University of Chicago; B. J. Horchem of the "Park Life"; Mrs. Carlysle of the Berkeley Board of Education; Professor Wickson, Dean of the College of Agriculture, University of California; Mr. True of the United States Experiment Stations; Louisa Klein Miller of Cleveland; and E. C. Bishop, Ames, Iowa; responded to toasts. All spoke enthusiastically of the work with which each is identified.

At the close of the luncheon Miss Alpha Rasor, as chairman of the luncheon committee, received many congratulations for its success.

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The afternoon meeting of July 12th was held in California Hall, University of California, with C. A. Stebbins acting as

chairman. Professor Babcock presided during the organization of the American Gardening Association. The constitution proposed by Mr. Kilpatrick and his advisors was adopted and the following officers elected for 1912:

President, V. E. Kilpatrick, New York.
Secretary, D. J. Crosby, District of Columbia.
Treasurer, Ellen Eddy Shaw, New York.
Vice-Presidents:
First, C. A. Stebbins, California.
Second, Louise Klein Miller, Cleveland, Ohio.
Third, Stella Nathan, Pennsylvania.
Fourth, Susan B. Sipe, Washington, D. C.
Fifth, S. B. McCready, Canada.
Sixth, W. A. Baldwin, Massachusetts.

The new officers for the Nature-Study Society will be announced later.

As a whole the meeting was successful in giving momentum to the nature-study and school garden movement.

The California branch of the American Nature-Study Society now numbers over one hundred members. The American School Garden Association starts in California with some eighteen regular and twelve associate members. We, in California, would like to see these two forces a common unit working for a common cause. Each has its specific definition yet both are desiring to accomplish the same result. The writer believes in the garden as a unifying element for the nature-study work. The garden is a little world patterned after the universe and in it are expressed all the forces which make for one's environment. These forces *work* in the garden—weather conditions, plants, insects, birds, etc., and in their natural working field they may be studied.

NOTICE TO MEMBERS OF THE A. N.-S. S.: Since the death of Professor Charles your president has been acting editor of the Nature-Study Review. The September number has been unavoidably delayed, and there may be some delay in the October number due to making change in management. Beginning with the October number Dr. E. R. Downing, School of Education, University of Chicago, will edit the Review. All communications should be addressed to him.

B. M. DAVIS, *President*

RESOLUTIONS

WHEREAS, the death of Mr. Fred L. Charles has come as a great shock to his friends in all parts of the country; and

WHEREAS, we, the New York Section of the American Nature-Study Society, desire to express our sense of profound sorrow and regret at his untimely end;

Therefore be it

Resolved, that the cause of Nature-Study in Elementary Schools has lost a wise leader and counsellor;

Resolved, that by his work and teaching he has inspired many teachers to renewed efforts in their chosen field;

Resolved, that in his official capacity as Editor of the Nature-Study Review he has shown marked qualities of leadership and initiative;

Resolved, that he has, through his zeal and industry, left an enduring influence that cannot but reflect credit on his name; and be it further

Resolved, that copies of these Resolutions be sent to his widow, and to Dr. B. M. Davis as representative of the American Nature-Study Society.

CHESTER A. MATHEWSON, *Chairman*
CHARLOTTE W. WETHERBEE
GILBERT H. TRAFTON

Committee of the New York Section, American Nature-Study Society.

NOTES ON PERIODICALS AND BOOKS

Tillers of the Ground. By Marion I. Newbigin. London: Macmillan and Company, 1910, vi+224.

Too infrequently is it possible for the grade teacher to turn from the multitude of "nature" books, the authors of which seem often to have more enthusiasm than knowledge, to a work like "Tillers of the Soil", written by an eminent and versatile British scientist, in a style at once simple and entertaining. There is nothing savoring of the pedantic and the attitude is intensely human throughout, not only in the picturesque description of the struggles of primitive peoples in getting their living but in the story-like references to the patient investigations of eminent scientists, such as Berthelot, de Vries, Liebig, Mendel, and Pasteur, and of the "plant-wizard", Burbank. The references to Pliny, Vergil, and other ancient writers, and to some of the astonishingly modern ideas of certain ancient Chinese and other orientals on breeding, and of the prehistoric Americans on irrigation, are not likely to be found elsewhere by the general reader. Quoting from the preface, "Books intended to promote interest in science must differ completely from laboratory guides, text-books, or works of reference. They should aim at exalting the scientific spirit which leads men to devote their lives to the advancement of natural knowledge, and at showing how the human race eventually reaps the benefit of such research. Inspiration rather than information should be the keynote ....." Nevertheless a surprising amount of interesting information is given without seeming to weaken the purpose just set forth.

The rather restricted title hardly does justice to the scope of this interesting little work. Not only does the book treat of tillers, savage and otherwise, but it traces out man's efforts to conquer Nature under various adverse circumstances, to carry useful plants from one country to another, to improve plants by selection and cross-breeding, and the relation of man's scientific activities to the betterment of agricultural conditions. The subject matter is divided into eighteen chapters.

The early part is well within the grasp of third grade children, either to supplement primitive life studies or to aid in the transition from home to world geography. This latter view is especially pertinent to rural school work. The story of the introduction of the date and the Smyrna fig into America fits in well with horticultural studies of the upper grades. These chapters and that on wheat rust illustrate how dependent, in the face of difficulties, is the so-called practical man upon the researches of the scientist.

Unfortunately there is no edition revised for American readers. Our children will be continually confused by the European use of the word "corn". Likewise, gorse and certain other terms, intended to elucidate foreign conditions to English children would, in turn, call for explanation or substitution. The author's nationality may excuse his somewhat premature reference to the "State of Arizona .....which contains the wonderful Canyon of Colorado and some perhaps even more wonderful antiquities", or perhaps the editor of the Scottish Geographical Magazine over-rated the speed of our Congress. C. H. R.

Beginnings in Agriculture. By Albert R. Mann, New York: The Macmillan Co. 1911, 20+317.

"This book is designed for the purpose of introducing the study of agriculture into the seventh and eigth grades of our elementary schools. It may also meet the need in some of the smaller high schools and in ungraded special and private schools". It is divided into four parts: The affairs of agriculture: The soil; Farm plants; Farm animals. Each chapter is followed by the number of questions or exercises called problems, 241 in all. B. M. D.

West Virginia School Agriculture. D. W. Working, editor, Morgantown, West Virginia: West Virginia College of Agriculture.

Vol. I of this publication began in November, 1910. It is published monthly from November to April inclusive. Each number is devoted to some special phase of agriculture adapted for use in public school instruction, e.g. No. 4-5 (pp. 67-88), Vol. I, to "Judging and Testing Corn". It is arranged in a series of lessons: The purpose of corn judging; How judging is done: The score card; Selecting seed corn; Will the corn grow; Will the corn yield; Will the corn mature; Is the corn improving; The profit in testing corn; Making the test; Conclusions from the test. B. M. D.

Agricultural Projects for Elementary Schools. By Julius E. Warren, The Commonwealth of Massachusetts, Board of Education, bulletin No. 1, 1911.

"This manual is prepared as a guide to teachers and superintendents in the introduction of work in agriculture in elementary schools". It consists of projects including potatoes, corn, tomatoes, beets, swiss chard, carrots, radishes, kohl-rabi, alfalfa, sweet peas; suggestions for garden work, including aims, nature of appeal to pupils, equipment, and general suggestion; Laboratory work, consisting of twelve exercises such as testing germinating power of small seeds, to show that plants need air, to show that liquids move upward through plants, etc.; Collateral work including letters, filing letters, diaries, themes, stories, illustrations, drawing, reading, memory, selections, arithmetic, etc. B.M.D.

The Junior Agriculturist, C. A. Stebbins, editor, Berkeley, California; University of California, College of Agriculture.

"A little paper issued twice a month for the boys and girls of California." The first number appeared March 18, 1911. This paper was planned primarily to reach the boys and girls who are studying agriculture in connection with the extension work of the University Agricultural department". Each number consists of two kinds of contributions; suggestions to pupils, the other letters from pupils giving accounts of their work. B. M. D.

Rural Education: The Soil, R. H. Emberson, Columbia, Mo.: Bulletin of the University of Missouri, Vol. X, No. 10 (1910), pp. 8.

This bulletin is intended for use of teachers in the rural schools but may be used by pupils of advanced grades. It consists of six lessons: How soils are formed; The kinds of soil; Soil texture; Soil tilth; The capillary water in soils; The free water in soils. B. M. D.

ALL ABOUT THE WILDFLOWERS

All the little bits of information about plants, that do not get into the technical magazines will be found in **The American Botanist.** This makes it a mine of information for even the well informed teacher. It gives you a new viewpoint and makes common things new in consequence. Sample copy free. Sample volume, unbound, 35 cents. Subscription 75 cents a year. A set of 16 volumes already published for $8.00 postpaid. Every nature-study teacher ought to order it today.

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THE
NATURE-STUDY REVIEW

DEVOTED PRIMARILY TO ALL SCIENTIFIC STUDIES OF NATURE IN ELEMENTARY SCHOOLS

VOL. 7 OCTOBER, 1911 NO. 7

WEED STUDY IN GRAMMAR GRADES

FANNIE RAGLAND, Wm. McGuffey School, Ohio State Normal College, Miami University

The study of weeds as outlined here represents a part of the Elementary Science work done by the Seventh and Eighth Grades of the William McGuffey School, of the Ohio State Normal College. A preliminary discussion showed the pupils to be in possession of two very important facts: first, that the weed is undesirable; second, that it is, to all appearances, a very successful plant. The weed was considered undesirable for many reasons. The pupils had noticed fields in which the corn was burning up, while the weed at its side looked thrifty. From this it was decided that the weed robs the corn of its moisture. Upon investigating poorly cultivated fields it was found that the weeds were robbing other plants of their light and food to the extent of crowding them out entirely. The pupils were also aware that mosquitoes and other insects like damp weedy places. The country boys contributed the further information that weeds sometimes make the milk of cows that feed upon them, very offensive. The class concluded that any plant, robbing our economic plants of their moisture, taking the food from the soil, harboring insects, rendering milk unmarketable, is not wanted.

For proof of the weed's success, the members of the class had only to look at the roadside, or at the garden that had not been cultivated during the month of September, to see that the weed grows after the other plants die from lack of care or are killed by the drought or frost. With this knowledge organized, a big problem presented itself, namely, *How is the spread of these undesirable yet successful plants to be checked?* Since it is impossible to fight an enemy not recognized on sight, and certainly much easier to fight one whose place of habitation and habits of life are known, these questions were considered first, but only as a means to the end. Four problems were therefore taken in the following order: (1) Identification, (2) Reproductive Potentiality, (3) Seed Dispersal, (4) Means of checking the rapid distribution of seeds.

The work of identification proved intensely interesting. In many cases the plant and seed were both necessary. The pupils brought both to the class room. Here they had at their disposal, The Second Ohio Weed Manual, a Bulletin on the Seeds of Michigan Weeds, and a tripod-lens. After identifying a specimen the seeds were placed in small vials and labeled. At first we went to the school garden for our weed study. These trips soon became unnecessary as the boys brought in weeds which they wanted to identify. Usually some member of the class thought he knew the weed. He attempted to prove its identification. Sometimes he failed to satisfy the pupils; and then the matter was fully investigated. In such cases the only thing to do was to study the seed and commence a search in the Michigan Seed Manual.[1] In this Manual seeds of natural size and magnified seeds were shown. In case the seeds were small the lens was used in order that its peculiarities might be noted. The lens proved useful in detecting the white spots on the catnip seed; and almost necessary in studying the waxball seed, with its irregular vertical lines and the black spots. The steel weed presented a new problem. No one could suggest a name and the seed was not to be found in the Michigan Seed Manual. It was only after consulting the weed herbarium of the Agricultural Department that the weed was identified. Crab grass, small crab grass, and finger grass were also distinguished by means of the herbarium. Yet most of the weeds were identified by means of the manuals mentioned above, and the lens. In identifying the weeds many interesting things happened. One day the entire class agreed that a certain specimen was the horse weed. They consulted their manuals to make sure. Those referring to the Michigan manual found the horse weed seed to be oblong, cream in color, 1 to 1.3 mm. long. Our seed certainly did not correspond to this description. Those with the Ohio Weed Manual at hand found two weeds, the horse weed and the tall ragweed, sometimes called the horse weed. The former had very narrow leaves, unlike the leaves of our specimen. The tall ragweed or horse weed had leaves like those of the plant under consideration and upon looking for tall ragweed in the Michigan Manual the seeds were found to correspond. The seed was found to be very much like those of the ordinary ragweed in shape. Thus it was concluded that the plant was only locally known as the horse weed. Thirty-two common weeds were soon identified by the class. Not only were the pupils familiar with the plants but also with

[1] See List of References Useful for Study of Weeds page 175.

the seeds. The seeds were put away for use in the seed analysis work.

The class had found all the weeds studied to be very successful plants. Next came the study of the characteristics which led to this success. The great number of seeds on each plant had been noticed. In order to get a more definite idea of their power of propagation, three plants of five specimens each were selected, and the number of seeds and space covered by each noted. In estimating the number of seeds, the seeds of a medium-sized branch and the number of branches were counted. In determining the space occupied, the radius of the space shaded at noon was taken as a basis. These problems were worked out with the three plants of each weed and an average of the three then taken. The results were as follows:

Name.	Number of Seed	Space Covered
Willow Lettuce	2435	105 sq. in.
Indian Mallow	2480	315 sq. in.
Spanish Needle	1163	78 sq. in.
Cockle Burr	270	408 sq. in.
Wild Carrot	880	233 sq. in.

The number of seeds was large and in order to show the great danger of allowing weeds to go to seed two more problems were worked out. (1) How much space will be required for each weed the second year, in case each seed produces an average plant? (2) How much space will be required the third year? These problems were worked with each of the five specimens with the following results:

Name	Space, Sec. year	Space Third Yr.
Willow Lettuce	$6\frac{1}{2}$ sq. rds.	99 a.
Indian Mallow	20 sq. rds.	309 a.
Spanish Needle	$2\frac{1}{3}$ sq. rds.	16 a.
Cockle Burr	$2\frac{2}{3}$ sq. rds.	$4\frac{1}{2}$ a.
Wild Carrot	5 sq. rds.	29 a.

The decision immediately followed that all weed seeds do not produce plants. Some are destroyed by disease, some killed by man or crowded out through his energy, others fall into or are carried to unfavorable places.

Next, the plants were successful because their seeds could so easily be dispersed. Among the weeds studied, some, such as the white top, canada thistle, milk weed and dandelion have the papus or feathery hairs attached to the seed, making it easy for the wind to carry them far and wide. Others such as the spanish needle are gathered by sheep, cattle and man, because of their

forked awns. Seeds, lacking these special devices, are carried about by birds, animals, wagons and trains. That the last two are important means of seed transportation is shown by the varieties, found by roadsides and railroads, not found in the neighboring fields.

By this time the pupils realized why weeds were so frequently spoken of as "persistent pests." They realized the full meaning of Bailey's words: "The new farmer complains of them. The poor farmer is possessed with them. The home gardener pleads for relief from them. Even the best farmers find them troublesome and sometimes unconquerable." They were ready to consider some way of checking their further distribution. To this end a seed analysis was made. The pupils obtained some red clover seed. Each boy weighed out one ounce of seed. With the help of a lens and pencil he separated the seed into four parts: (1) Pure seed, (2) por seed, including broken and shriveled seed, (3) dirt, (4) weed seed. The five samples analyzed showed the following results:

Sample.	Pure Seed.	Poor Seed.	Dirt.	Weed Seed.
No. 1.	93%	5%	0%	2%
No. 2.	95%	4%	0%	1%
No. 3.	88%	11%	0%	1%
No. 4.	84%	11%	0%	5%
No. 5.	94%	5%	0%	1%
Average	90%	7⅕%	0%	2%

The weed seeds were then identified by means of the seeds which had been saved. The seeds of the moth mullen, catnip, narrow plantain and Pennsylvania smartweed were found to be most common. Upon consulting authorities, telling of the purity of grass seeds, the students concluded that their samples were comparatively free from weed seeds. For example, the Michigan Seed Manual told of a sample of something called clover seed, which contained forty per cent of narrow plantain.

Thus the pupils in finishing the work had very clearly in mind: (1) that weeds differ from other plants in that they are not wanted; (2) the reproductive potentiality of some weeds is so great that they become real pests; (3) not only weeds having particular devices, but others are easily carried from place to place; (4) if the farmer is to check their further distribution he must not sow them.

The writer feels that this work might very profitably be followed, in the Spring, by a brief study of the different classes of weeds—annuals, biennials, and perennials—and the special methods of exterminating each.

WEED LESSONS

G. A. BRICKER, Agricultural Education, Ohio State University

A weed has been defined as a plant growing in the wrong place. From the standpoint of the farmer, weeds may be defined as uneconomic plants. They are frequently a source of great annoyance to farmers. Some weeds are more to be dreaded than others, and farm boys should learn about the different kinds and some of the most important facts about them. In order to study weeds it will be necessary to refer to various publications. In addition to references included in "List of Useful References for Study of Weeds" page —, Gray's "Manual of Botany of the Northern United States," and Mathews' "Field Book of American Wild Flowers" may be found helpful.

In a few years all the weeds of the community may be included in the "Weed Herbarium" of the local school. These herbariums should be open for the inspection of the people of the neighborhood, and thus it will naturally come to be a source of useful information to them.

In case a weed is secured that cannot be identified it should be carefully packed in a pasteboard box and sent to the State College of Agriculture for identification.

A WEED HERBARIUM.

(A practicum.)

Make a collection of the worst common weeds of the community. Mount them on cardboards of uniform size, 12 by 18 inches. Label them properly and preserve them for future reference.

To mount the weed specimens, the following directions should be followed. Secure a specimen of the weed desired that will go on the mounting card. Thoroughly cleanse it. Immerse the plant for three to five minutes in a bath of alum water, which is made by putting two ounces of powdered alum into each gallon of water used. Remove the specimen from the bath, dry it, and place it on the cardboard in the desired position. Now cut off all stems on the under side that interfere with its lying perfectly flat. Thick stems, roots, blubs, and other enlargements should have their under half cut away, and the remaining half should be hollowed out. Transfer the specimen to an ironing board well padded with paper or cloth, cover it with a cloth, and iron it with a hot iron until dry. Turn the specimen over, heavily smear the underside of all its leaves, stems, and roots, with library paste. Turn the specimen back, and replace it on the

cardboard in the position that it is desired for permanency, and press down all the various parts firmly and carefully.

WEED SEEDS.

(A Practicum.)

Make a collection of the seeds of the various weeds in the herbarium. These seeds should be placed in vials, which should be corked, and properly labeled.

LESSON IN WEEDS

C. A. STEBBINS, Instructor in Agricultural Education, University of California

[Reprinted from Town and Country Journal.]

LESSON XIII. WEEDS.

Unit of Instruction—The Wild Morning Glory.

General Topic Aims—To add interest to the study of plant life through the wild morning-glory as a typical weed; to teach the relation of weeds to other plants and to man; to add, from this study, more emphasis on the mutual dependence and helpfulness of nature, and to give further foundation for understanding its unity.

Specific Lesson Aims—To teach the children to recognize the wild morning-glory; to understand its economic status; to devise and apply a method of control; to teach its characteristic habits of life.

Children's Aim—To get rid of the weed which is crowding the other plants and over-running the gardens.

The following outline will be suggestive to the teacher. The teacher must not forget that the children are interested primarily in getting rid of the weeds.

After this typical weed has been studied, field trips should be made to make comparative study of seed dispersal, etc.

Weeds

1. Field Study.
   - A. Recognition.
     1. General form of plant.
     2. Location of leaves and flowers.
     3. Characteristic of seeds.
     4. Habits in growth.
   - B. Seed dispersal.
   - C. Character of locality of occurrence.
     1. Soil, relief, animals.
   - D. Collections of seeds and leaves.

E. Special topics, special adaptations.
F. Harmfulness.
1. Killing of other plants.
a. Shading.
b. Sapping the ground.
c. Crowding.
2. Unsightly.
3. Poisonous.
a. Animals (loco weed, etc.)
b. Man.
4. Excessive loss of moisture.
2. Classroom Study correlated with field study.
A. Uses.
1. Medicine.
2. Protection.
a. Shade.
b. Wind break.
c. Home for insects.
3. Fertilizer.
4. Food for animals.
a. Birds.
b. Horses, cattle, etc.
c. Man.
5. Prevent erosion and shifting.
a. Hillsides and sand dunes.
B. Remedies against.
1. Artificial.
a. Cultivation.
b. Plows.
c. Hoes.
d. Mowers, scythes.
e. Fires.
2. Natural.
a. Fires.
b. Birds.
c. Insects.
d. Pasturing.
3. Government control.
a. Laws.
C. Distribution.
1. Transfer of entire plants or parts of plants.
a. Wind.
b. Water.

c. Man.
d. Animals.
2. Plants without care running to weeds.
3. Seeds.
a. Wind.
b. Water.
c. Birds.
d. Animals.
e. By plants (runners).
f. Man.
a. Commercial seed.
b. Nursery stock.
c. Farm machinery.
d. Railroads.
1. Hay.
2. Packing.
3. On cars.

THE GARDEN OF A PHILIPPINO TEACHER AT NORMAL INSTITUTE, LINGAYEN, PANGASINAN, PHILIPPINE ISLANDS.

(See Page 190.)

LIST OF USEFUL REFERENCES FOR STUDY OF WEEDS

B. M. DAVIS, Miami University

Weeds and How to Eradicate Them. By Thomas Shaw, St. Paul, Minn.: Webb Pub. Co. (1911), 236. Price, cloth 50 cents; paper, 25 cents.

Various common weeds are described, and methods of eradication are discussed. The chapter headings are as follows: The prevalence of weeds; The evils which arise from presence of weeds; The possibility of destroying weeds; The agencies concerned in distribution and propagation of weeds; Methods and principles generally applicable in destruction of weeds; Specific modes of eradicating weeds of the thistle family; Methods of eradicating weeds of the mustard family; Eradication of weedy grains; Specific modes of eradicating miscellaneous troublesome weeds.

Farm Weeds. By Geo. H. Clark and James Fletcher. Dominion of Canada, Department of Agriculture (1909), 192. For sale by single copies only, Supt. of Stationery, Government Printing Bureau, Ottawa, Can. Price $1.00. Following an introductory discussion of weeds (including loss, spread, classification, weed seeds in soil, control, general principles, etc.) the various weeds are taken up in families beginning with the grass family. The description of each weed includes synonyms, history, seeds, time of flowering, propagation, occurrence, injury, and remedy. The book is illustrated with seventy-six excellent full page colored plates.

Seed Dispersal. By W. J. Beal, New York: Ginn and Co. (1904), 90. Price 35 cents.

The seeds described in this book are mostly of weeds.

Descriptive and Geographical Study of the Grasses of Iowa. By L. H. Pammel, C. R. Ball, and F. Lamson-Scribner, Des Moines, Iowa: State Department of Geology, Iowa Geological Survey, Supplementary Rpt. (1903), 436. Price $1.00.

Since many of the grasses are weeds this report is valuable for study of weeds. Each species is fully described and illustrated.

The Weeds of the Miami Valley. By Grace M. Kalter, Oxford, Ohio; Miami University, Miami Bulletin, Ser. IX, No. 2 (1910), 72. Price 20 cents.

A good artificial key to families of weeds is given, followed by description of various kinds of common weeds.

A Second Ohio Weed Manual. By A. D. Selby, Wooster,

Ohio: Ohio Agricultural Experiment Station, Bulletin 175 (1906), 92. In addition to description of 385 plants, the seeds of 139 plants are illustrated.

Seeds of Michigan Weeds. By W. J. Beal, East Lansing, Mich.: Michigan Agricultural Experiment Station, Bulletin 260 (1910), 182.

Accompaning the description of each kind of weed are two or more excellent illustrations of its seed, one natural size, others magnified. Often several views are given.

Kansas Weeds. By A. S. Hitchcock and J. B. S. Norton, Manhattan, Kan.: Kansas Agricultural Experiment Station, Bulletin 57 (1896), 64.

This bulletin contains description of 209 weeds followed by 22 plates illustrating typical leaves of various weeds.

Adulterants and Weed Seeds in Grass Seed, etc. By H. Garman, Lexington, Ky.; Kentucky Agricultural Experiment Station, Bulletin 124 (1906).

The most common weed seeds usually found in grass seed are described, and illustrated by 23 good plates.

Clover Seeds and their Impurities. By F. H. Hellman, Reno, Nev.: Nevada Agricultural Experiment Station, Bulletin 47 (1900), 90.

Weeds. By Vernon H. Davis, Columbus, Ohio: Ohio State Agricultural College, Extension Bulletin. Vol V, No. 1 (1909), 15, a general discussion of weeds with particular reference to distribution and to eradication.

Weed Studies. By L. H. Waldon, Fargo, N. D.: North Dakota Agricultural Experiment Station, Bulletin 62 (1904), 18.

Stock Poisoning Plants. By L. Vanes and L. R. Waldron, Ibid Bulletin 58 (1903), 30.

Feeds, Seeds, and Weeds. By E. H. Jenkins, New Haven, Conn.: Connecticut Agricultural Experiment Station, Bulletin 161 (1909), 6.

Publications of the United States Department of Agriculture.

Division of Botany:
Russian Thistle: The Migration of Weeds, Bulletin 15.
Legislation Against Weeds, Bulletin 17.
Division of Agrostology:
Florida Beggar Weed, Circular 13.
Farmers Bulletins.
Weeds and How to Kill Them, No. 28.
Thirty Poisonous Plants, No. 86.

Saltbushes, No. 108.
Weeds Used in Medicine, No. 188.
Alfalfa Seed, No. 194.
The Lawn, No. 248.
The Farmers Interest in Good Seed, No. 111.
The Seed of Red Clover and Impurities, No. 260.

Collections of Weed Seed. U. S. Department of Agriculture, Bureau of Plant Industry. One hundred kinds of seeds, including common weed seeds. The seeds and work of preparation are furnished by the Bureau of Plant Industry, but it is necessary for those desiring sets to supply tray and vials used. These can be obtained at a cost of $1.50 from Messrs. MacKall Bros., 9th and H streets, N. E., Washington, D. C., to whom remittances should be made direct with request that material be forwarded to office of this Bureau. At same time the Bureau should be notified that such remittance has been made.

Purdue University, Agricultural Extension Department. A remittance of 35 cents is required to pay for cost of preparation of set.

North Dakota Agricultural College, Fargo, N. D. For particulars write to C. E. Nugent, Secretary of Agricultural College (Fargo, N. D.).

Ontario Agricultural College, Guelph, Canada. A charge of 25 cents is made for postage and preparation. Address, Botanical Department.

SUCCESSFUL SCHOOL GARDENS

One of the features of the Weld County Agricultural Fair, in September, 1910, was the school garden exhibit from the gardens of the Colorado State Normal School. Here on a table forty-five feet long were exhibited one hundred and five varieties of garden products, all raised by the children of the Training School, from the kindergarten to the eighth grade. Here the garden lover found choice samples of old and new vegetables, all most attractively displayed, and all most interesting because they were grown by children. It was really surprising to find the quantity, quality and variety produced by the little gardeners. There were mammoth pumpkins and squash, a great quantity and variety of root crops, such as salsify, turnips, carrots, beets, parsnips, etc., besides onions, cabbage, kale, kohlrabi, tomatoes of four varieties, peppers and eggplants. One found, too, peanuts, pop-corn, melons, cucumbers, lettuce, parsley, as well as such farm crops as wheat, barley, broom corn, Kaffir corn, and many others.

Only twenty entries were made for competition, yet fifteen prizes aggregating $22.50 were awarded. When one considers that these vegetables, grown in small gardens by children, were entered in competition with the products of ten and twenty acre tracts handled by men having years of experience in gardening, one can realize to some degree how excellent was the whole exhibit. The entire area given over to the school gardens at the Colorado State Normal School is hardly an acre in size. For some of the entries it took nearly every vegetable of the kind we had.

The exhibit attracted much attention and excited much interest, especially on the part of children. Yet the grown-ups were very much interested and made many favorable comments. Since school children were admitted to the Fair free one day, nearly all the children of the city, as well as many from the country, saw the exhibit. Undoubtedly, this exhibit had a great educational value, for it showed the possibilities of a little garden well tilled; it demonstrated, also, that a great variety of garden produce can be successfully grown in this region. I hope, that the exhibit brought to the people, the great educational value school gardening may have. All the children were enthusiastic. The exhibit, undoubtedly, was a great stimulus, for those who had gardens will try to do better this year, while the others, in town and country, will have gardens of their own. The big pumpkins and squash were patted and admired by every boy

who saw them, while the other vegetables received their share of praise. The strange kinds brought out many questions, "What are they?" "What are they good for?" "How were they grown?"

In our school garden work all the children of the Training School take part. Ground space, seeds and water are furnished the children by the school. The children break the ground, prepare the seed-bed, plant the gardens, cultivate, weed, and water their gardens until school closes in June. By that time they have the gardens in such condition that they need little attention, aside from watering, until the children come back in September. They then begin work again, clean up their gardens, stake and tie the taller crops, and harvest, from time to time, the crops which have matured. It is wonderful what a little plot can produce if well cared for. A row of beets, one of carrots, another of parsnips, a few cabbage and tomato plants, with radishes and lettuce grown between the rows, yield a generous supply for the family larder. The older children have large gardens, so the quantities of produce they take home are often considerable. We try to supply those who have been unfortunate with their gardens from our experimental gardens, so that none

THE COURT WITH ITS LOWER AND UPPER GARDEN—THE CEDARS AT THE RIGHT CONCEAL THE ITALIAN POOL.

go home empty-handed and discouraged. It is amusing to see the joy children show when they have a pumpkin. Every child in the school had at least one pumpkin last fall, which, no doubt, has long since been made into a Jack-o-lantern, or, perhaps, into goodly pies. Most of the children also carried home all the beets and carrots they could carry. Many came back two or three times to take home their produce. Quite a few were fortunate enough to have peppers and tomatoes, cabbage, popcorn, root-crops, besides flowers. We try to restrict the choice of crops to be grown in the gardens to the commoner kinds, kinds that will be ready for the children when they come back in the fall, and not those which mature in summer, when so many of the children are away from the city. We find, however, that with a little encouragement, many of the children will come to take care of their gardens after school has closed.

Our aim in this garden work is to make the children realize something on their garden experience and teaching, not only in material form, but to gain knowledge which they can use in their homes. We aim to give them knowledge of garden handicraft that will be of use to them after they have left school. We found that the small, individual garden bed, six by ten feet in size, was not practical for the older children, that it did not hold their attention and interest as when they first started gardening. This is not strange, for a garden of this size, a type used so much in school and vacant lot gardening, gives little enough for the effort expended. It is too small for an active, energetic boy or girl. Moreover, the size is impractical. No successful gardener attempts to grow vegetables in beds. We found, too, that a better knowledge of gardening would be of great service to the people of this region, for the rural people do little gardening here. Every farm should have a garden, and this should yield the farm home a constant supply of fresh vegetables and fruits. Many city lots, too, could support a large garden, the products of which would go a long ways in keeping down the cost of living. The small garden bed will not yield the necessary experience and instruction needed in gardening on a larger scale. If children are instructed to garden on a larger scale, they will get better ideas of garden handicraft, more practical and useful knowledge of the essential principles of agriculture, and a larger, better experience. Our idea is to make everything as practical as can be, to give the children knowledge and experience which they can actually use and to stimulate them to use this. The country life problem

will not be so serious when country children are stimulated to become interested in the country and its affairs, when they take an interest in nature, in agriculture and the country home. The latter must be made more attractive, too. It must be improved as well as the methods of agriculture, outdoors as well as indors. To stimulate country children to do this they must be interested in gardening. The garden is the place to begin the teaching of elementary agriculture, not the schoolroom and the textbook. We have all too many textbooks on agriculture already. Children will be interested in growing peanuts, popcorn, beets and carrots, poppies and asters, long before they are interested in the dry recital of facts and principles of farm methods. In growing these things, they will get first-hand, practical knowledge of agricultural principles, while this knowledge will stay with them and be used by them. This one cannot always say of textbook teaching. The school garden with its flowers and attractive plants is the place to interest children in the improvement of the grounds about the school and the home. Too many people read about gardening and leave the home grounds as they are, desolate and cheerless. Too many teachers wait until Arbor Day to

Courtesy of Doubleday, Page & Co.

THE ITALIAN POOL.

interest children in planting trees, and, even then, recite poems and sing songs instead of planting. We should get out more and dig. But this gardening and teaching should be practical. Cut out the sentiment and singing until you have something to sing about. Dig and plant first, then sing.

In our garden work here, to make the gardening as practical as possible for the older children, we let them co-operate. In this way a larger space may be cultivated and more practical results obtained. Each of the four upper grades have a large garden. This is called a Model Home Vegetable Garden, since it is designed to yield a constant supply of fresh vegetables for family use. Everything is grown in straight rows and these are wide enough apart to permit convenient cultivation and irrigation. These rows are from thirty to sixty feet long. All of the commoner vegetables are grown, as well as kinds that may be unfamiliar to the children, but which should have place in every garden because of their worth. The size of the garden and the number of things grown varies with the age of the children. The Seventh Grade garden, for example, was 100 feet long and 45 feet wide. In this space about twenty-five kinds of vegetables may be grown.

Such a garden can be successfully managed on the home grounds and give good results. Since it is on a large and practical scale, it presents many real problems which have to be worked out. The working out of these problems affords invaluable experience and first-hand knowledge, which may be applied after school days are over. In addition to the practice gained in this type of garden, the children are given practice in growing flowers and plants suitable for the decoration of home yards. Practice is also given in the care and handling of lawns, in planting trees and shrubs. Some of the ornamental plants in our nursery are propagated by the children. Talks and lessons are given on home grounds and civic improvements, how to plan a better arrangement and where to plant flowers and shrubs. Children are stimulated to improve their home grounds, to clean these up and to keep everything in order there. On Arbor Day, especially, the teaching centers on these things. Then every child is given a tree, or a shrub, to plant on the home grounds. The children are so eager to get these, while we feel that the gift brings home the lessons of the day, that it may stimulate an abiding interest.

School gardening has a great future, yet we have scarcely begun to realize its possibilities. As a laboratory for a first-hand

practice in nature study and agriculture, the school garden has no equal. In order to teach these subjects properly, every school should have a school garden. Where this is done it will be found that the children of the country will take a greater interest in the country and all its affairs. By school gardens the little country school will be transformed from a place of desolation and cheerlessness into a picture of beauty, and then become an inspiration and stimulus for the whole country. There may be many difficulties in the way; but the thing to do is to forget these and actually make some beginning by digging and planting, by planning and working, NOW.

Gilbert T Trafton formerly of the State Normal School of Passaic, N. J., is now with the State Normal School of Minnesota at Mankato in charge of the nature study work and agriculture.

E. E. Balcamb, formerly of the Rhode Island State Normal School, and secretary of the National Committee on Agricultural Education and of the N. E. A. Department of Rural and Agricultural Education has entered on a new line of work instituted by the North Carolina Normal and Industrial College, at Greensboro, North Carolina, in which it will endeavor to push agricultural education and nature study generally among the teachers of the state.

CONFERENCE ON AGRICULTURAL EDUCATION AT THE MASSACHUSETTS AGRICULTURAL COLLEGE, AUG. 2-4, 1911

W. R. HART, Massachusetts Agricultural College

There were three programs on three separate days. The program of August 2nd was in charge of Professor E. E. Balcomb, of the State Normal School of Rhode Island. The theme for discussion was "Training teachers to meet the demands for teaching agriculture in the public schools."

The demand for teachers of agriculture is widespread and insistent. The headlong action of some states in legislating agriculture into the schools without making adequate provision for training teachers for that specific work is to be deprecated. The importance of agriculture as a school subject makes it all the more needful that it be well taught. This fact places an unusual burden upon the teacher who undertakes the task of introducing the subject. It lays an especial responsibility upon those who are engaged in the training of the teachers for their work. The grades of work for which teachers must be prepared will require different kinds of training as well as different degrees of preparation. Preparation for teaching agriculture in schools below the high school may be secured in normal schools and special classes. This preparation in school must be reinforced by practical gardening or farm work. Work of this elementary type will seldom extend beyond what may be done with the aid of simple schoolroom apparatus and the school and home gardens. Agricultural colleges will have the chief responsibility for training teachers of agriculture for high schools and academies. A fairly comprehensive study of the special sciences along with agricultural science must enter into such training. Added to this scientific knowledge, the teacher must have had much practical farm experience. He must also be able to carry on practical exercises himself and make them demonstrate the truths he is endeavoring to teach in the class room and laboratory. Individual states as well as the Federal government will need to contribute more liberally towards the training of teachers of agriculture. The responsibility of the teacher of agriculture to the community is greater than that of any other teacher. In rural communities he must become in some degree an adviser of adults as well as an instructor of youth. Such functions call for qualities of a high order. The teacher of agriculture will, therefore, be much more valuable to the community than the teacher of any other subject. The compensation of successful men and women in this work will naturally be greater.

Experience is already showing that men of this type cannot be secured for less than $1,200 to $1,800 a year.

The program on August 3rd was devoted to the general topic of Agricultural Education. The conference was under the direction of David Snedden, Commissioner of Education of Massachusetts. Recent changes in Massachusetts laws enable towns or cities having high schools to introduce vocational departments in agriculture. The state will reimburse the town or city to the extent of two-thirds of the salary of the instructor. These vocational courses must conform to standards of instruction, equipment, and qualifications of teachers set by the State Board of Education. The plan involves the elimination of most all work now given in most high schools except English, history and civics. Whatever mathematics and science remain must have special reference to the efficient practice of agriculture. Practical agriculture must occupy one-half of the student's time. In this regard the plan resembles the part time schools for trades, where half of the pupil's time is in the shop and half in school. Persons who do not give promise of continuous and successful work will not be admitted to such departments. The aim of the special agricultural schools as well as the agricultural department in a high school is vocational and not cultural. Vocational education fits one for efficient production. Liberal education enables one to make right choice and good use of what the race has produced. A large amount of what is done as agricultural education is not vocational. Text book agriculture may be in a high degree liberalizing. For training efficient farmers the older pedagogical notions must be reversed. The business of teaching must begin with an immediate, concrete situation. The situation must have its difficulties and problems. The pupil must see the problems presented by the situation and the teacher must show him the way towards a solution. In all of this teaching of agriculture the pupil must carry on a home project of a practical character under the supervision of the instructor during the summer.

August 4th was devoted to a consideration of problems connected with children's gardens. The following program was carried out. It was under the auspices of the Home and School Garden Club.

Aims and Scope of Children's Gardens.....Ellen Eddy Shaw
Associate Editor of the Garden Magazine, New York.
The Home Grounds as a Garden.....H. D. Hemenway
Secretary People's Institute, Northampton, Mass.

Weed Gardens and Their Uses.....W. J. Beal, Ph. D.
Professor Emeritus of Botany, Mich. Agri. College.
Report of Committee on District and State Exhibits of
Children's Garden Products.....W. R. Hart, Chairman
Business.....Election of Officers

Dr. Beal gave some very helpful suggestions on weed gardens. The number of weeds in the state of Michigan increased in thirty years' time from less than 25 to more than 250. They get onto the farm by means of adulterated seed, bought in other states and in foreign countries. When they once get a foothold the seeds of many of them will remain in the ground for thirty years without losing their vitality. The art of destroying weeds rests on the science of the growth habits of different species. All weeds can be killed if kept deprived of their green parts for a greater or less period of time. In the case of some this requires frequent repetition. The weed garden should be kept perfectly clean and each species made to stay in its own place. The weed garden will help the student to a better knowledge of the nature of plant life. Weeds have developed an enormous power of self-propagation. Many weeds have food values at certain stages. Many others are medicinal. Hundreds of them furnish nectar for the bees. The doctor's favorite definition of a weed is, "A plant whose virtues have not yet been discovered by man."

A NATURE CREED IN THE CONCRETE

M. LOUISE GREENE

Such might be a terse description of a recent event in the history of a large publishing house.

Except as a mere item of news of interest to booklovers, the transfer of the offices, printery and bindery of Doubleday, Page & Company to Garden City, Long Island, finds no place in an educational journal. Yet the recent house-warming of the Country Life Press and the outing—the third of a series—on May 23, of some fifteen hundred people to Garden City as the guests of Doubleday, Page & Company revealed a novel and distinctively educative feature in their new home,—one that should be of interest to teachers and to all who care for outdoor life.

In these days, nearly every home, store, office or even shop has its credo posted in full view. Suppose we consider some of the thirteen articles of the Country Life creed as illustrated by, or exemplified in, the recent migration from New York.

At the close of their tenth year of successful business life, Doubleday, Page & Company began to look about for a new home. It must have space, air, sunlight, possible homes,—not houses, only,—for employees, easy access to New York and quick output for rail and freight. Such a business as theirs, if properly located, would with reference to nearly a thousand employees tend to *"draw people from crowded cities into open spaces"; would "foster a love of the wide outdoors, the home of health and broad horizons."* Such a home was found in Garden City, thirty-five minutes from the new Pennsylvania Station, New York City, and on an electrified branch of the Long Island Railroad running into that station. The fine old town of Hempstead, Mineola, and a dozen small towns, with their lower cost of living for workingmen, were within easy trolley distance. Moreover, such a location would practically add about 20% to the leisure time of an operative's day. For the office force, travel under the river and across Long Island would replace in part the crowded subway and elevated train. Truck, freight and mail matter actually moves faster, leaving New York more quickly than when passing through their congested agencies in the metropolis.

Thus is shown the possibilities and here are answered some of the objections to a large business concern locating in the country under conditions that *"keep active the love of all things that live and grow, of birds and animals in free and unendangered*

lives, of great trees that bless us in their growing and in their sacrifice"; that *"inspire communion with nature in all moods"*; that *"encourage the owning of houses and land and foster love of home."*

"To teach good taste in architecture and to encourage the building of better homes," one finds on the crescent-shaped piece of ground, fully half a mile in length, a handsome building containing on the third floor editorial departments for books and magazines, all necessary minor offices, a large composing room, type-setting machinery department, electrotype foundry, and photo-engraving department. On a lower level, paper comes in from freight cars at the north end of the building and goes out a finished product at the south end, where auto-trucks and steam cars bear it away at the rate of 15,000 magazines and 500 books per day. (This output could be doubled by adding more machinery.) In this great building, there is no bit of machinery over six years old. Better still, there is sufficient sunlight and practically not a spot forty feet from a great window. These windows in this building, which is 400 feet long with wings 200 feet deep, look down upon a great court 125x200 feet with two large fountains and with greenery even in winter, while there is a continuous bloom of hardy flowers that changes every three weeks from earliest spring blossoms to those that stand a nip of November's frost. On the gala day, poet's narcissus and pansies fringed the basins of the fountains while in the border beds columbine and other flowers were coming into bloom.

"To help with all practical problems of country living," reads the credo;—*"to minister to all the needs and enthusiasms of those who live in the country and love it."* Large affairs suggest possibilities on a smaller scale. The use of electricity about the building; the best plumbing; an ample water supply cooled for drinking and sufficient even for irrigation of the farm tracts; an excellent system of ventilation; dustless cleaning by the vacuum process; rest rooms and restaurant for several hundred people,—these within doors, and without, the use of concrete in sheds and buildings, a garage, tennis and ball grounds enter into the illustrative material for these two texts.

Of interest is the fact that work on the buildings began June 1, 1910, that printing machines began to work just three and a half months later, Sept. 26, 1910, and that the office force moved in October first. Not a single person holding a responsible position objected to the change, and in the mechanical department, alone, hundreds of applications were received from

persons who wanted to move away from the city. This change to country surroundings was based upon the purely business considerations that the new conditions would favor greater efficiency.

Many acres about and near the building *"preach the gospel of the garden, of the planting of trees and shrubs and flowers, and the making of better gardens"; "spread,"* also *"the new discoveries of the newest agriculture and help to make farming more effective."* There are forty acres to do this, and they do it, even now. A few words as to how.

Passing from the special train which had been run into the grounds over the Doubleday, Page & Company's spur track, their guests saw everywhere signs of newness, of rawness, even. And yet, at the turn of a path this was lost sight of as one came upon a large open-air room enclosed by tall cedars which surrounded a sizeable pond where fish sported in the clear blue water of the Italian pool. Out from this green room, stretching southward half a mile, runs a broad, shaded pathway touching the court with its upper and lower gardens and continuing past the experimental plots and the Remembrance Garden to enter the rose garden with its smaller cedar room containing the unique sun dial. The dial, 5x7 feet, is to be of bronze or brass on marble base. It is unique in that the customary signs of the zodiac are replaced by the printer's marks used during the first half century of printing. The model showed the name, date and mark of twelve famous printers, including those of Caxton, Gensen, Aldus, Schoeffer, Ulrich Gering, Guillaunne La Rouge, Theiry Martin, the St. Albans' press and others. The gnomen is placed upon the fold of the open Guttenberg Bible below which is the text

"O Measure of Time!
Thou merest mite within the Providence of God,
May thy unerring finger ever point
To those who printed first the written word."

The Remembrance Garden is for the growth of seeds and seedlings whose parent plants dwell in the gardens of famous personages or of authors whose works are published by the Country Life Press.

The two gardens of the court are bordered, the lower by many hundreds of little plants of box; the upper by a low hedge of arbor vitae, while elsewhere, privet and cedar are used to advantage.

There are 2,000 small pines in the nursery. Dwarf and pyramid fruit trees dot the orchard tracts. Early crops traced their furrows in the experimental farm. Sunlight sash revealed luxuriant growth in hot bed and cold frame. Two hundred and forty-six plantings of sweet peas, some of fall sowing, demonstrated vitality and quality for the National Sweet Pea Society of America. A pergola of thirty-four cedar posts, set about 15 feet apart, promised future harvests from dwarf-grown fruit trees and a glory of bloom from over-arching climbers. Vines starting here and there foreshadowed the beauty of their later years.

Business enterprise that it is, is it not of worth to the always welcome visitor whether seeking novelty, beauty, plant lore or practical help on the problems that confront the home gardener, truck-farmer, breeder of livestock, lover of kennels, landscape gardener, or farmer of many acres? It is an object lesson of value to all teachers, not alone to those of nature study or elementary agriculture.

Among the letters received by the Secretary of the Nature Study Society is the following one, which will be of interest to readers of the Nature Study Review, showing how completely the nature study interest has circled the globe. The garden (shown on page 174) will make envious some of those who are struggling with school gardens in our more rigorous climate.

Manilla, P. I., July 28, 1911.

The Secretary, American Nature Study Society.

Dear Sir: Enclosed find a money order for $1.00 for membership fee for 1912. Glad to help along such a movement. I find the Review interesting as well as instructive. The Philippino teachers are greatly interested in nature study. Surely this speaks well for the people in the far East.

W. F. La POINTE.

EDITORIAL

It is the glory of nature study that it deals with commonplace things; the plants of the dooryard, the animals of the wayside, the weeds of the waste places are its appropriate subject matter.

Nature is not the only school subject which is turning our attention to the commonplace things; elementary agriculture, sewing, cooking, gardening, shop work and commercial branches are taking their places as proper school subjects. They deal with objects that are in our everyday environment, the things of the workaday world. It is well for the nature teacher—indeed for every teacher, to realize the significance of this introduction of such commonplace things into the school curriculum. It is a relatively new move in education.

A century since the children of the masses were toilers. Child labor was everywhere prevalent; it was a necessity. It took the combined efforts of the whole family among all but the aristocracy to keep starvation from the door. Then the giant powers of the universe were harnessed to aid human weakness; mighty steam and deft electricity supplanted human brawn and tired muscles, freeing the little laborers from the slavery of premature toil. It is this industrial emancipation that has produced the revolution in the school curriculum. Now the schools are for the children of the masses, not for the favored few.

These common people demand an education that shall be based on the elements of their everyday tasks and their usual environment. The schools must serve this new constituency and the educator faces an herculean task—to replace the old course of study, the product of centuries of pedagogical experience with a course composed largely of subjects that have a distinct wage earning value and yet that shall have much cultural value as well.

We as educators must see to it that in the hurried demand for practical things, for elements in the school course of study that shall have commercial values, we do not lose sight of the fact that it is imperative to still pass on to the new generation, that vast social heritage of the past. Nature study must do more for the farmer lad than show him how to successfully win a few more bushels of grain from a reluctant soil. That is eminently worth while, and yet that is not alone worth while. Humanity in its evolution has spent long ages in close contact with nature laying, in the nervous system, those essential foundations of sensory development which have made possible the intellectual and moral achievements of the race. It is well for the individual to retrace

the path by which man has climbed and keen his senses in the out-of-doors. But this process should lead on, in the individual as it has in the race, to high thinking and fine morality.

The world owes much to these fruitful friendships with nature. They have been a never failing source of inspiration to prophet, poet and philosopher. The Lake country of England, our own Concord Valley are incarnate in classic literature because they have so shaped the characters of the men who lived within them that their writings exhale in common the essence of the region. Literature and art are children of one parent, Nature. Freedom dwells in the hills. Religion has drawn its best parables from field, flower and sheep fold. The great leaders of the world have spent at least their most impressionable years close to nature. Sturdy character, in the individual as in the race, is the gift of the mighty forest, the measureless plains, the silent yet voiceful sky.

NOTES AND NEWS

The editor of the Review is in receipt of a letter from U. S. Senator C. S. Page, together with copy of a bill introduced at the last session of Congress. This is entitled "A bill to co-operate with the States in encouraging instruction in agriculture, the trades, and industries and home economics in secondary schools; in maintaining instruction in these vocational subjects in State Normal Schools; in maintaining extension departments in State Colleges of Agriculture and Mechanic Arts; and to appropriate money and regulate its expenditure." The bill carries with it some generous appropriations for the purposes indicated in the title, and yet no more than is eminently reasonable. Two or three paragraphs from Senator Page's letter will state the reasons for the bill cogently:

The High School, the Academy and the College are taking excellent care of those boys who are financially able to avail themselves of their advantages, but it requires only a superficial examination to show that the average boy, on arriving at the age when he must begin, because of lack of means, to be a bread-winner for the family, is neglected by the State and in far too many cases, following the lines of least resistance, drifts into a cheap manhood.

That Germany is now outrunning us in the race for commercial supremacy is universally conceded. In my judgment, this is due in a large measure to the fact that when the German boy reaches the age of 12, 13, or 14, his characteristics, his physical equipment, the bent of his mind—his idiosyncracies, so to

speak—are carefully ascertained and he is given a training which equips him for the life work which he decides to follow.

We spend ten or twelve million dollars to build and equip a single battleship. The same sum spent for the benefit of these boys who are to be our farmers and industrial workers, and for those girls who are to be our home-makers, would change the whole course of their lives and thereby materially benefit the nation.

BOOKS AND PERIODICALS

A new magazine which will be of interest to many readers of the Review, appeared in September. This is the first number of volume one of Vocational Education, issued from the Manual Arts Press at Peoria, Illinois. It is a bi-monthly magazine, planned to cover the broad field suggested by its title. The editorial staff insures a magazine of high grade and includes Charles A. Bennett, Professor of Manual Arts, Bradley Polytechnic Institute, William T. Bawden, University of Illinois, Arthur D. Dean, State Education Department, Albany, New York, Frank M. Leavitt, Associate Professor of Industrial Education, University of Chicago, William E. Roberts, Supervisor of Manual Training, Cleveland, Ohio.

The early numbers of the magazine are to be devoted to the different types of vocational schools, especially those supported at public expense.

Two bird books from the press of Witherby and Co., London, deserve notice. One is a practical guide—Photography for Bird Lovers, by Bentley Beetham, F. Z. S. This is a manual of a hundred and twenty-six pages giving excellent advice to the amateur and some new wrinkles to the expert. It is illustrated with very good half tones, results of the author's success in bird photography. The explanations of methods and suggestions regarding apparatus are concise, clear and eminently practicable.

The second book is a splendid brochure, artistic in its binding, type and illustrations. It is "The Home-Life of a Golden Eagle" by H. B. Macpherson. The author gives us the results of an intimate study of the rearing of a young eagle. Three months, April 23 to July 23, were spent in watching the baby grow from fledgling to the time of its first venturesome flight. The setting of the story is in the Grampian hills, that rugged mountain region of the Scotch border. The camera caught many delightful pic-

tures of the uncouth baby and its royal parents. Thirty-two of these illustrate the volume. One only wishes that more of the author's details of observation accompanied the pictures. There are only thirty-eight pages of text. Yet enough is given to make a fascinating tale of hardships and persistence and a vivid idea of the life history of this great bird.

Photography for Bird-Lovers.—Cloth 5s.

The Home-Life of a Golden Eagle.—Paper 5s.

There has recently come from the press of Ginn & Co. a new text book in botany, under the title of "Practical Botany," by Joseph Y. Bergen and Dr. Otis W. Caldwell. The book contains twenty-six chapters, which average about twenty pages each. After a short discussion of the occurrence of plants in nature, there follows a brief treatment of the roots, stems and leaves, buds and branches, the flower, pollination, seeds and seed distribution. With chapter ten the authors take up the discussion of the great groups of plants using in general the stock examples as types of the various groups. Chapter twenty begins with what may be called the economic part of the book and the remaining chapters are largely economic and ecological.

The book seems to be a very well balanced work treating with equal fulness the different divisions of the botanical field. While the authors have condensed the material greatly the book has not suffered from it and one does not feel that he is reading a mass of dry facts as is so often the case in texts of this character.

The authors have certainly made the material justify the title, and have given us a real "Practical Botany" and the time is ripe for its reception. ($1.25). W. McN.

ALL ABOUT THE WILDFLOWERS

All the little bits of information about plants, that do not get into the technical magazines will be found in **The American Botanist.** This makes it a mine of information for even the well informed teacher. It gives you a new viewpoint and makes common things new in consequence. Sample copy free. Sample volume, unbound, 35 cents. Subscription 75 cents a year. A set of 16 volumes already published for $8.00 postpaid. Every nature-study teacher ought to order it today.

WILLARD N. CHUTE & CO., ...JOLIET, ILL.

Fred L. Charles

THE

NATURE-STUDY REVIEW

DEVOTED PRIMARILY TO ALL SCIENTIFIC STUDIES OF NATURE IN ELEMENTARY SCHOOLS

Subscriptions, Manuscripts for Publication and Books to be Reviewed should be sent to the Editor.

VOL. 7. NOVEMBER, 1911. No. 8

American Nature-Study Society

Annual Meeting. The fourth annual meeting of the Society will be held December 27-28, at Washington, D. C., in connection with the meeting of the American Association for the Advancement of Science. Detailed announcement of program, etc., will appear in the December issue.

Nominations for Officers, 1912. As provided by the constitution, the Council has made the following nominations for officers to be elected at the annual meeting:

For president—B. M. Davis (Ohio); M. A. Bigelow (N. Y.).

For vice-presidents (vote for five)—D. J. Crosby (Wash., D. C.); S. Coulter (Ind.); G. H. Trafton (Minn.); F. L. Holtz (N. Y.); W. L. Stevens (Mo.); F. L. Stevens (N. C.); Anna B. Comstock (N. Y.); H. H. Cummings (Utah); H. N. Loomis (Conn.); M. A. Bigelow (N. Y.).

For directors (vote for five)—L. H. Bailey (N. Y.); C. F. Hodge (Mass.); C. H. Robison (N. J.); E. E. Balcomb (N. C.); S. C. Schmucker (Pa.); Laura E. Woodward (N. J.); J. A. Drushel (Mo.).

Secretary-Editor—Elliot R. Downing. The University of Chicago, The School of Education, Chicago, Ill.

(Members who do not attend the meeting should mail their ballots to the Secretary), at the University of Chicago, the School of Education, before December 15. Seal ballot in envelope marked "For Officers, 1912."

Officers Holding Over. The following officers elected in 1910 hold over for another year:

Directors—Ruth Marshall (Ill.); E. B. Babcock (Calif.); J. Dearness (Ont.); Otis W. Caldwell (Ill.); Anna B. Comstock (N. Y.).

Fred L. Charles

Fred L. Charles was born at Aurora, Illinois, November 15, 1874. His parents were people of more than ordinary intelligence, his father being County Superintendent in Kane County, and thus was closely identified with school work. His education was obtained in the graded and high school at Austin, in the Northwestern University, where he graduated, and in the University of Chicago where he did post-graduate work. He won literary prizes at Northwestern University and was a member of a local fraternity consisting of highly congenial spirits to whom he became very warmly attached and whose friendship he always retained. He was also pledged to Beta Theta Pi and to Phi Beta Kappa. University life was particularly delightful to him for he had a strong institutional sense, cultivated, doubtless, by the constant church membership which began when he was a boy of nine and continued through his life.

He seems early to have inclined strongly to biological work and in order to fit himself more completely for instruction in that department, he spent two summers at the Marine Biological Laboratory at Wood's Hole, Massachusetts. He received the B. S. degree from Northwestern and his M. A. degree from the University of Chicago.

When a student he aided in his support by private tutoring, at one time having under his charge some of the children of Eugene Field. He became a teacher in the Lake View High School, at Chicago, his subjects being rhetoric and biology. He became interested in the subject of elementary science—Nature Study it is more commonly called now—and gave instruction at local centers established in the city for the instruction of public school teachers. He showed no small degree of skill along those lines, and it was this fondness for the more elementary aspects of scientific work, and his skill in organizing courses, that attracted the attention of the President of the Northern Illinois State Normal School, at DeKalb, and really determined his appointment in that institution. He began his work as Professor of Biology in September, 1899, and remained there for the succeeding ten years. His work was very successful, inspiring in the students a genuine love of nature and awakening a real enthusiasm along all the lines covered by his work. It was not at all unusual for him to be found in the early morning with a group of earnest students exploring the fields and groves in order to get at natural objects under natural conditions. He did most interesting work in the way of original observations

upon the feeding habits of robins, and especially upon the care of their young, doing, perhaps, as thorough-going a piece of investigation along this line as has ever been made.

In 1909 he was called to the University of Illinois as Assistant Professor of Agricultural Education. He was selected for this particular field because of the aptness that he had shown in arranging lines of work for beginners. He was expected to go into the country and aid rural teachers in starting work in their schools in the Elements of Agriculture. It was also an important part of his duties to meet rural groups in public meetings and discuss with them the methods of introducing subjects into their schools that would bear directly upon the improvement of rural life. He found his life at the University very attractive and entered into it with the greatest zeal.

He assumed the editorship of THE NATURE STUDY REVIEW with the January number, 1910, following the first editor of the magazine, M. A. Bigelow, of New York. It was a duty that devolved upon him as Secretary-Treasurer of the American Nature Study Society, to which position he was elected at the winter meeting in 1909. How well he did his task all its readers know.

In 1904 he married Miss Elsie Davis and shortly after built the unique cottage that is so easily recognized and that is known in DeKalb as "The Charles House." It bore the marks of his artistic individuality. There his two children were born in 1906 and 1908. He was intensely devoted to his wife and his little ones with whom he lived in tenderest intimacy. Nothing could come between him and the inmates of his beautiful home.

Professor Charles was not a robust man. He was slight of figure, possessed a marked nervous temperament and was extremely sensitive to his physical and social surroundings. He was greatly afflicted with insomnia, from which he suffered for more than twenty years. While very reticent about it, he brooded over it because of its interference with his ambitions and thus added to the evil that he sought to mitigate. In consequence his health was seriously impaired and his spirits correspondingly depressed. The matter was graver in character than even his most intimate friends or the members of his family appreciated. He died at his home in Urbana on the sixth day of May, 1911. His untimely passing was sorely regretted by his friends everywhere. A great career seemed to be opening before him. It is believed that he would have realized it fully if his life had been spared.

JOHN W. COOK.

Fred L. Charles: An Appreciation

By C. A. McMurry.

During the ten years that Fred Charles companioned and labored with us at DeKalb, we knew him in the common relations of life as a man of worthy aims and kindly spirit. We saw him as friend and companion and found him genial and hearty. He was chosen originally as a member of the teaching force of the Normal School because he had already made a reputation as a successful teacher of science and especially in the effort to create interest in nature study. He was distinctly a nature lover of a poetic temperament. He was a good example of the kind of interest and enthusiasm which the genuine observers of out-door life in fields and woods have stood for. His training in college work had gained him a strong drift toward scientific studies in biology and towards modern scientific spirit and method. But he was primarily poetic in temperament and looked upon natural things with a sort of human interest. This kindly devotion to natural studies showed itself in his love of wild animal life; even the snakes received a good share of his kindness and good will. The bears and wolves, the foxes and rabbits, the birds and insects had a kindly friend who enjoyed appreciating and sympathizing with them in the life struggle.

In the early days of this nature study enthusiasm, it was somewhat difficult for him to get into sympathy with applied science, with the strictly utilitarian or useful phases of science or with such topics as useful scientific inventions, sanitation, mechanics, etc. In our discussions along this line, he showed a strong preference for the beauty and variety of wonders in nature rather than for the practical utilities of such things as milk testers, disinfectants, corn-shellers and soil fertilizers. He was, of course, not unmindful of the remarkable utilities of science, in steam engines, machines, in modern medicine, in agriculture and manufacturing, but his own choice was for those out-door phases of nature that appeal directly to the observant and enthusiastic naturalist. From this point of view it seems probable that he was somewhat drawn aside from his natural bent when he turned his attention to those problems of agriculture and practical farm life which have lately occupied so much attention in connection with courses in rural schools.

In the Normal class-room he was a stimulating teacher, arousing interest and enthusiasm, displaying illustrative skill in his graphic blackboard sketching, and yet holding to somewhat

rigid requirements in student's work. His demands from students in the way of exact observation and skillful and accurate drawing were sometimes regarded as over-exacting. He wished to give his work a strong scientific quality that would command the respect of scientific experts. He was also ambitious to develop along the higher lines of scientific study and in a university career.

One of his strong points was his devotion to nature study as it was being developed in the grades of the common schools. He was a successful teacher of children and they remember him with pleasure. It was easy for him to get into friendly relations with children and to lead them into interested observations. It was our custom to ask the Normal School instructors to give illustrative lessons with children's classes, and then submit to criticism from other teachers. He was always willing to undertake such trial work and submitted to criticisms with candor and good will. In all these important duties and relations he exhibited the qualities of an earnest, versatile and capable teacher. At the same time he gave himself unreservedly to other more social interests of the school in its broader life. In the early years when we were developing and organizing the life of a new school in those channels which have since grown somewhat strong and traditional, Mr. Charles contributed much of social spirit and leadership. He drilled the classes for years in their rehearsals, public exercises and plays. He entered into their plans for class entertainments and drilled them into successful performances. On the ball field he played vigorously in the games and did not shirk the rougher work of athletics. In this latter respect he showed much of physical hardihood, and entered fully into the athletic training of the young men.

And yet by natural temper and makeup Mr. Charles was very sensitive, easily hurt by unkind or harsh treatment. He was not exactly fitted for the rougher uses of life. He was too sympathetic and sensitive to be a fighter. He was tender-hearted, social and affectionate, and these qualities he retained strongly into manhood. This gentler side of his affections showed itself noticeably in his relations to his mother especially and later in his own home life. The affection between him and his mother was remarkable and her death was a sore affliction to him. His interest in church and religious life was strong, and he was active and appreciative of efforts for moral and religious progress. In the local politics of the town also he showed an interest in needed reforms that surprised his friends.

In these various ways Mr. Charles manifested the lively,

energetic participation of a young man in all those things that concern the welfare of home and of society. He was ambitious for the best things. His heart was set on the higher purposes of living. He admired people who had won their success and repute in literature, in science or philanthropy. This broad and generous outlook upon life and its problems, combined with his kindly social nature, made him a companionable associate, a worthy friend. The only way in which we remember him distinctly is in connection with such manifestations of his pleasing and stimulating personality.

F. L. Charles' Pet Racoon.

Strange Pets

Cyrus B. DeVry.

Director of the Lincoln Park Zoölogical Garden, Chicago.

In compliance with your request to contribute to your highly interesting publication something concerning animals that are not commonly adopted as pets, I will say that very few persons who live in civilized communities, especially those born and reared in flats, have any idea as to the variety of creatures that readily become the companions of lonely men and women and the playmates of children.

As the problems of the Self are now being investigated with such widespread avidity, I will first call attention to that yet unnamed mystical attraction that, at first contact, establishes confidence between certain members of the human family and animals; among the latter many that are called wild, ferocious,—hence dangerous.

There are many instances of persons who have formed intimate companionship with creatures from whom the average city dweller would flee at sight. Lions, tigers, leopards,—all the various members of the great cat family, have been known as pets. Bears, wolves, foxes, deer, raccoon, opposum, prairie dogs and many other kinds of so-called "wild animals" have responded gladly to that peculiar, undefined something contained in some human beings that converts a creature, ordinarily regarded as an enemy, into a cherished friend.

Where children are born and raised in more or less isolated localities, and are not constantly warned by nervous mothers to "look out, it may bite you," it is not at all uncommon to find pets made of creatures that would produce hysteria in young or old brought up in the artificial environment of so-called civilization.

Not to go too deeply into lines of research that yet baffle science, I will only say that fear is often a greater menace than the apparent cause thereof. A person who is without fear incurs far less risk than one who faces an animal boldly. In that regard there is a similitude with disease; the less you are afraid in that ratio diminishes the danger of being attacked.

The young of most animals have, some time and somewhere, been made pets. Some remain docile and affectionate a long time, others become less tractive on reaching their maturity and less safe to handle as they grow old. Much depends on the

character and disposition of the human to maintain good fellowship with animals indefinitely.

I will say, here, that the pet, of whatever kind, that is taken during a temporary fad, that is pampered and coddled and becomes attached to its owner, is to be pitied when another species becomes the fashion and the old love is cast off for a new.

In such cases the Zoo becomes a haven of refuge as is attested by numerous presentations of monkeys and other animals whose companionship is no longer desired.

The Breeding of Canaries

By Chas. B. Davenport.

Director Carnegie Experiment Station, Cold Springs Harbor, L. I.

In other countries particularly in Germany and England the breeding of canaries is a wide spread avocation. In certain towns of Germany, especially around the Harz Mountains, nearly every family rears each year a number of canaries. The neighbors have formed a canary society and meet frequently to discuss individual birds and the proper sort of matings to secure improved offspring. Each family will subscribe to a paper that is concerned with canary interests. In England there are two such papers which comprise from 32 to 64 large pages, are published weekly and are sold for a penny. It is surprising and very unfortunate that in this country so little interest is paid to the fascinating art of breeding canaries. However, in Greater New York there are two canary societies and in other places canary societies have been organized with a more or less fleeting existence; but there is no paper in the United States devoted exclusively to canary interests and exhibitions devoted exclusively to canaries are uncommon, although one or two are held annually in Greater New York and canaries are often exhibited at poultry shows.

Canaries are bred with different aims and, in consequence, various breeds have been established. In Germany, the primary interest is in song and most of the organized breeders in this country, who are prevailingly Germans, are engaged in breeding song birds. These are commonly called the Harz Mountain canaries and may be of any color,—green, yellow or mottled. In England, the fanciers pay more attention to form. Certain breeders specialize on the crest, others on the size of the bird, others work with the cinnamon (which is a diluted green) and others develop along the line that the Belgians have made almost their own, namely that of a slender, long legged bird, the so-called "Scotch Fancy" or "Belgian." More rarely other types are exhibited, such as canaries with frizzled feathers, those with feathers that have light margins (called "lizards"), albinos and so on.

Canaries are easily reared in cages kept in rooms that are warmed during the winter time in places where they are not subject to cross drafts. It is necessary that they should not be kept too warm nor deprived of fresh air. Water and seed is to be kept constantly before them and the cages cleaned at least once a week. A weekly bath should be provided. The standard food

consists of a mixture of seeds, millet, canary, rape and hemp; cuttle bone is useful and lettuce leaves, pieces of apple, and other fruit, bread crumbs and particles of other food from the table may be given occasionally for variety. About the first of March a pair of canaries should be placed together in a cage and provided with a nest which may be purchased at any fancier's store and consists of a little wire cup in which is placed a layer of felt. The female deposits from 2 to 7 eggs, incubates them for from 12 to 14 days and then feeds the young by placing food in their mouths. In this she is assisted by the male. When rearing young it is customary to feed the old birds hard boiled egg grated fine and this is good at any time. During the breeding period it is well to omit the baths which are supplied during the rest of the season as the wet birds will tend to chill the eggs. Egg laying usually ceases in August and the parent birds may then be returned to a larger cage. In mating the birds the male can be distinguished from the female by the fact that it sings. In case one wishes to be sure of the identity of the offspring of a particular pair of birds they should be provided with legbands. These legbands, stamped with numbers, may be obtained of John H. Parker, 125 S. 7th Street, Philadelphia, Pa. By keeping records of the origin of birds at the same time the numbers are placed upon the legs an accurate pedigree history may be preserved and one may make an interesting study of the inheritance of color, crest, song and so on.

In conclusion the reader is referred to Cassel's *Illustrated Book of Canaries and Cage Birds,* written by Blakston and others, which costs about $8 and is the best of its kind, and to *Cage Birds,* a weekly periodical published in London.

Something About Guinea-Pigs

By W. E. Castle.

Bussey Institution, Harvard University.

A favorite pet animal with children, and one often seen in bird stores, is the guinea-pig, a harmless, compact looking little animal with a voracious appetite for vegetable food of various sorts, and well known for its remarkable powers of increase.

Fig. 1 (Top)—Self-Colored English Guinea-Pig.
Fig. 2 (Middle)—Dutch-Marked English Guinea-Pig.
Fig. 3 (Bottom)—Albino English Guinea-Pig.

My friend, the surgeon, says that the guinea-pig is the most important domesticated animal of American origin. This statement will surprise most persons for two reasons, first that it should be considered an American animal, and second that it should be considered important. Yet American the guinea-pig unquestionably is, and further it is *South* American. There and nowhere else in the world all its wild relatives live. That is all its *near* relatives do; the more remote ones include even man. For the guinea-pig is first of all a mammal, as is man, a hairy animal nursing its young with milk. It belongs further to the order of rodents, the gnawing mammals, along with rats and mice, rabbits, squirrels, chipmunks, and wood-

chucks. But the particular family of rodents in which the guinea-pig belongs, the cavy family, is one found wild in South America alone. In that continent occur many sorts of wild cavies which range in size from that of a mouse to that of a good-sized dog. These wild cavies vary greatly in their habits and habitats. Some kinds live in the mountains hidden among the rocks by day and coming out in the twilight to feed upon tender herbs and grass. Other kinds lead a similar life in the river valleys and make sad havoc with the farmer's crops. One of the largest kinds lives in the water of the streams, somewhat after the manner of a hippopotamus. All the cavies are strict vegetarians, and for the most part inoffensive. They depend upon their agility to escape enemies, as rabbits do, and, like rabbits, a band of cavies is not weakened by the occasional loss of a member or two to a beast of prey or to man. The loss is soon made up if the food holds out, for they multiply with great rapidity.

Fig. 4 (Top)—Albino Angora Guinea-Pig.
Fig. 5 (Self-Colored Abyssinian Guinea-Pig.
Fig. 6 (Bottom)—Albino Peruvian Guinea-Pig.

The Indians before America was discovered, killed the abundant wild cavies for food, as their descendants do at the present time, and in order to have a regular supply on hand took to keeping in their cabins a certain kind a

little larger than a rat which was easily tamed and bred freely in confinement. This practice still continues among their descendants. The Spaniards, who overran South America soon after its discovery, took the domesticated cavy of the Indians back to Europe with them. What they called it, I do not know, but we find that the French very appropriately have named it the Indian pig (*cochon d'Inde*). The Germans call it simply the sea-pig (*Meerschweinschen*) to indicate, I suppose, its *over-sea* or foreign origin. The same idea perhaps underlies our name the *guinea-pig,* though the "guinea" here is by some thought to be a corruption of Guiana, the South American country from which the domesticated cavy may possible have been taken to Europe.

Under domestication the guinea-pig has varied greatly so that at the present time very many varieties are recognized. It is not unusual at exhibitions of pet stock to see as many as fifty or sixty distinct varieties listed. When we examine these varieties critically, however, it is seen that although no two are alike many of them have certain points in common so that it is possible to divide them into larger groups of varieties alike in particular points. The so called English varieties are those which have short, smooth coats similar to that of the wild animal. The color, however, of the English varieties varies greatly. Abyssinian varieties differ from English in having a rough coat, one in which the hair instead of lying smoothly backward all over the body, as in an ordinary mammal, radiates outward in all directions from certain centers producing thus cow-licks or rosettes. A fuller description of the Abyssinian will be made unnecessary by a glance at Fig. 5.

Angora varieties are those which have a smooth coat like that of the English, but possess long soft hair not unlike that of the angora goat, hence the name. Angora animals, as well as Abyssinians, occur in all known color varieties and color patterns, the distinctive feature of the angora being its long soft fur, while the distinctive feature of the Abyssinian is its rough short coat.

Peruvian varieties are those which combine the long soft fur of the angora with the rough or rosetted condition of the Abyssinian. They too may occur in all color variations.

There are no other features which distinguish these four groups of varieties than the two which I have mentioned, namely, differences in the length of the coat and in its roughness. And it is probable that these four groups of varieties have arisen from two simple but independent variations (or sports) which have subsequently been combined in all possible ways in the four

groups of varieties mentioned. Thus the English animal is short haired and smooth, the Abyssinian is short haired and rough, the angora is long haired and smooth and the Peruvian is long haired and rough. No other distinctive features occur, amateur books on pets to the contrary notwithstanding.

The large number of distinct varieties into which these four groups are sub-divided rest wholly upon differences in the color of the hair, which again have probably arisen by four or five independent varieties or sports. Color variation in the guinea-pig is more striking and instructive than that in almost any other domesticated animal notwithstanding the large number of color varieties. These, like the groups of varieties based on other characters, really depend upon a very few distinctive features, which features are wholly independent of the variations in hair length and coat roughness that form the basis of the four groups already mentioned.

The principal color varieties are the agouti, of which two sub-varieties differing in depth of color, golden and silver, are recognized; the black, the chocolate or brown, and the yellow of which several different types may be recognized. The agouti variety is one which has a coat of black or brown hairs tipped with yellow. In the black varieties the yellow tip of the hair is wanting as it is also in the brown variety. Yellows lack black and brown pigment in the fur, though this regularly is seen in the skin of the feet, nose and ears.

Animals which possess one of the four types of coloration just enumerated, namely the agouti, the black, the brown or the yellow, may show this coloration either over the entire body or in particular regions of the body, the rest being white, or in still other cases known as tri-colors, the animal may show two of the types mentioned as for example black and yellow or brown and yellow, in different regions of its body, while the intermediate regions are wholly uncolored. This is perhaps the most striking and best known color variety of the guinea-pig, the one oftenest seen in bird stores and kept as pets by children. The tri-colored variety known as tortoiseshell, in which large distinct areas of intense black and deep yellow stand out on a white back ground, is a most striking one and is oftenest seen among the English or short haired, smooth varieties.

In addition to the colored varieties just mentioned, there occur albino or wholly white individuals which have pink eyes, this variation, like the varieties in coat color being wholly inde-

pendent of the roughness or length of the coat. Compare the figures of English, Angora, and Peruvian varieties.

As regards their habits guinea-pigs are native in a temperate climate where freezing is unusual and green vegetation can be secured at all seasons of the year. They thrive best upon a diet such as their native country affords. They are exclusively vegetarians and will eat a variety of vegetable food. Grass is perhaps better than anything else for them when available, but when not they do well on carrots, lettuce, celery leaves, beet tops and the like. They are also very fond of grains of various sorts, especially oats which may be given to them either with the hulls on as to horses, or in the familiar form of rolled oats. When they are kept upon a dry diet for the most part (but they should never be kept exclusively upon dry diet) they should also be supplied with water. Guinea-pigs will endure a considerable amount of cold but should in general be kept in a place where freezing does not occur and if they are kept in a basement or other room that becomes quite cold at night they should be supplied with an inverted box having a hole cut in one side, which will serve them as a house and which will be sufficiently heated by their own bodies if they are kept as they should be under such circumstances, in families of half a dozen or so. Each family should obtain not more than one adult male, otherwise there will be serious domestic difficulties liable to result in bad bites or even in death. The females, however, will live peaceably several in a family in which respect they are said to differ somewhat from man. The young are born in a well developed condition with eyes open and fully clothed with fur so that they are able at once to begin independent feeding. Within ten days or two weeks, if they have grown properly, the young may be weaned and within another two months another litter of young may be expected from the same mother. The young are born usually in litters of two or three and they grow rapidly, if well fed, attaining a condition of maturity (though not of full growth) in from three to five months.

To the medical man and the public health officer the guinea-pig is not a pet but a domesticated animal of the greatest value in the study of diseases and how to prevent them. The guinea-pig has in this way been of incalculable value to science, which fact will explain the seemingly extravagant estimate placed upon it by my friend the surgeon. Strangely enough the guinea-pig, unlike ourselves as it seems to be, reacts in a very similar way to various organisms which produce disease in man. This is

the reason why it has proved so indispensable in combating many diseases, notably in the case of diphtheria. Diphtheria antitoxine has saved thousands of human lives but its present method of preparation would be quite impossible without the use of guinea-pigs, as well as of the horse, in experimental tests, not necessarily fatal but made to avoid uncertain results with the life-saving diphtheria antitoxine, in the case of man himself.

The Child's Need of Pets

By F. M. Lane.

Principal, Washington Grammar School, Fresno, Cal.

The subject of *Pets and Animals* for young children is an important one from many view points. It has the practical side to it: for the boy or girl who learns to care for rabbits, dogs, birds, or other animals obtains ideas of feeding, watering, housing, and breeding that can be gotten in no other way.

To children who are residents of the rural districts this practical knowledge gained by caring for pets is not so important, because the environments of the country children give opportunities to learn about domestic animals and fowls; but to the child in the city, this personal knowledge of animals is largely obtained by rearing and caring for household pets. There is no intention, however, of suggesting that boys and girls in the rural districts should be deprived of their cats, dogs, colts, etc.

This caring for animals causes children to form a habit of doing something at regular intervals. In the morning, it is feed and water the animals or birds; and in the evening when school closes, it is hurry home to take care of the pigeons, guinea pigs, or rabbits, as the case may be. It is much to be regretted that some children live through each succeeding day with never a thought that there is anything for them to do save to eat the food that is prepared for them, and wear the clothes that are furnished them.

In the human family is an underlying principle that we form an attachment for the things to which we voluntarily devote our time and energies. The little child who has a cat, bird, or rabbit, and who plays with it, and cares for it, develops a certain amount of kindly feeling for this pet in particular and a better disposition for animals in general. The child's affections are increased, are broadened, are strengthened. He has a kindlier feeling for not only animals about him, but for every one with whom he comes in contact. He has assumed a better attitude for his sur-

roundings; his love for the world has been stimulated; he has become a better individual.

Children who have pets derive much happiness from them. This happiness would be lost entirely without the opportunity of childhood friends. Parents take much pleasure in providing their little ones with playthings, and the children relish the opportunity thus afforded for amusing themselves. No one would think of discontinuing this practice.

There is a great deal more to be gained by the children from pets and live playthings than there is to be gained from mechanical contrivances. Neither should be omitted from the child's life.

By having pets and animals, the imagination of children is stimulated and strengthened. We often see a boy with a goat or dog hitched to a little wagon. His mind while accomplishing this feat considers many features of work carried on by men, and the child evidently is thinking of what he will do when he arrives at his majority.

Some Farm Animals

By Prof. Louis D. Hall.

Department of Animal Husbandry, College of Agriculture, University of Illinois.

[Professor Charles was largely instrumental in arranging for nature study instruction for rural communities presented from a trolly train side tracked at convenient places. The following outline is furnished by one of the party of instructors. It is given in its rather disconnected style so that it may convey the question and answer method of instruction used. A good teacher needs to be as keen a cross examiner as a successful lawyer.—Editor's Note.]

Boys and girls, you go to school, don't you? How many go to school? How many study geography? How many races of people have you learned about in your geography?

Five.

How many races of sheep does your geography tell you about? Not about any, does it? How many races of sheep do you suppose there are?

Two. Five.

There are more than two—there are more than five. There are about twenty that we have in this country. Twenty different kinds, and here is one of them.

Courtesy of Ginn & Co.

First Prize Southdown Ram.

We brought along a little lamb from the University—a pet lamb, but not only a pet lamb but a lamb that is good for something. The best kind of pets for children to have on the farm are pets that are good for something. But when we are talking about sheep we call them breeds instead of races.

This is the Southdown. The Southdown is different from the others. Do you notice the face? A mouse-colored face and ears.

Of the twenty races or breeds of sheep, some are mutton and some are wool sheep. The mutton breeds all have this square form that the Southdown has—level on top—square and wide as a wagon, almost. Square as seen from the side, too. We could put the body in a box and fill the four corners full. Why? Because there is so much meat. It is the meat that makes it square—not the wool. If we should shear the sheep, we would still have a nice plump lamb.

There are some other breeds that are just like the Southdowns, square and blocky—the Shropshires, Oxfords, Lincolns, Hampshires, and others. And then there are some other sheep altogether different. Here is one of them. (Showing picture.)

Courtesy of Ginn & Co.

An American Merino.

Can you see anything different from the lamb on the platform?

They have horns, and wrinkles on their neck.

Why are those wrinkles there?

To make room for more wool.

What else?

His face is not mouse-colored like the other, and you can't see his eyes.

Yes, sir, he has wool all over his eyes. He can see *you,* though. He might run and butt you before you knew it.

What else is different?

Bigger.

Bigger, yes, but the Southdown would get as big. What else?

Shorter legs.

Yes, and more wool on the legs. Wool grows clear down to his toes. The wool is finer, too. There are more fibers of wool on each square inch because they are smaller. And so this is a sheep that is intended for wool more than for mutton. I told you that the Southdown was intended for mutton more than for wool. There are some other sheep that have wrinkles all over their body, and you see they would have still more surface for wool. Those we call the Merinos, and this one is a French Merino, which has rings only on its neck. If you should look down or see him from above, you would see that he is narrower. The Southdown is flat on the back but the Merino is sharp. The difference in shape is caused by the difference in amount of lean meat and of fat those two kinds have on their backs. I want to show you just how much meat there is on those backs.

How many of you have ever had a mutton chop? Well, some of you have missed something pretty nice.

If we should take a mutton chop from this Southdown's ribs (that is where they come from), we would get one thick and well covered with lean and plenty of fat meat mixed through the lean to make it a good deal more tender and juicy. It would be the same way with the other mutton breeds, too—the Shropshires, Oxfords, Lincolns and Hampshires. If we take a chop from the same part of the wool sheep we would get a small chop. Now which would you rather have?

One from the Southdown.

The Merino chop is tough and hasn't much fat mixed with it, and anyone would rather have the chop from the Southdown than from the Merino.

Well, boys and girls, when we are going into the sheep business, even if we start with sheep as pets, if we are going to have sheep at all, it will pay us very profitably to study those sheep and keep the very best kind we can keep for mutton or for wool.

Now, in Illinois, most of the sheep are mutton sheep, or ought to be, for here we can feed them on corn, and corn is better for mutton sheep than for wool sheep. The wool sheep grow better in countries where they have only grass and that sort of feed.

When a man goes into the business of making boots and shoes, he has to study the hides that the boots and shoes are made from—study all there is to know about hides—and then how to make them and how to sell them; how to make the kinds that people will pay the most money for. When a man goes into the mutton making business by raising sheep, he ought to know the different kinds of sheep and the different feeds necessary to make the sheep into mutton, and then how much it is worth and whether it is good. And so you see, you and I can study our business as much as anyone else. A boy on the farm has just as much to learn and can be just as much educated as a boy studying the law business, or railroading, or many other things boys leaving the farm have to study.

I spoke about pets. Many of you have dogs and cats. Did you know there are more dogs in Illinois than sheep? Well, you will know it if you start down the street and see all the dogs. One reason why farmers don't keep sheep is because there are so many dogs. Did you know that dogs kill sheep? Well, most farmers say they can't raise sheep on account of dogs. If we would keep just the good dogs, like shepherds and watch-dogs, there would be more sheep in Illinois. There are more than six million people, nearly seven million, and less than one million sheep. Only one sheep for every seven of us. Now, that isn't right. If you boys learn to study sheep and love them the same as dogs and cats, pretty soon we would have more sheep in Illinois than we would know what to do with. And there is just as much to learn about horses and cattle as about sheep.

Now we will talk about beef cattle and beefsteak. How many like beefsteak? Everybody likes beefsteak.

The cow on this picture is something like the Southdown sheep, that is, square on the corners. If we take off the head and legs the body would fit nicely into a box. This is not a milch cow. Her feed is not turned into milk and put into the milk pail, but turned into beef. And a great share of the beef is laid along the back from the shoulder to the hips, where it is worth more money than on the other parts.

Do you know what we call this one?

The Aberdeen Angus.

Do you know what we call this one?

Courtesy of Ginn & Co.

First Prize Aberdeen Angus Cow.

Shorthorn Holstein.

No, the Hereford. They have short horns but are not real Shorthorn cattle. Notice the short legs, and how square, level and wide it is on top. This is another kind of which we keep a great many in Illinois.

The Shorthorn isn't black and white. It is red and white. Some are roan and some are red. Some are white. Shorthorns are beef cattle, too. Both of these are level and square, and many of the Shorthorn cows will give more milk than the Hereford and Aberdeen Angus, and that is why we have so many in Illinois. Most farmers want enough milk for the family. Cows that give much milk seldom make good beef animals.

Here is a good steak, isn't it? Isn't that as good as they generally have at the meat market? Do you suppose that came from a milch or a beef cow?

Beef cow.

Yes.

This comes from the loin, just in front of the hip bones. It is called porterhouse steak. You see it is well covered with lean, and the fat is white.

Now, let me show you another steak and see what you think about that. Ever see one like that?

Yes, sir.

This one hasn't as much lean meat on the bones, hasn't as

Courtesy of Ginn & Co.

TWO HEREFORDS SHOWING BEEF FORM.

much fat on the outside nor marbles through the lean. What color is that fat?

Yellow.

Yes. We all know that butter is yellow, and so this cow is a butter cow and not a beef cow. The fat looks too much like butter to be good beef. We want white fat in beef even though we have butter fat in the milk. A Jersey cow gives yellow milk, and Jersey cows have yellow fat on their bodies for the same reason.

Here is something you are all acquainted with—the pig. How many can tell me the name of this pig?

Berkshire.

Yes. The nose turns upward, and the ears stand upward while the Poland China's hang down. The Berkshire is about the same shape as the Poland China—a little longer, perhaps, and if we should take a ham or bacon strip from the Berkshire we would see that it was quite a little leaner. The Berkshire pigs have more lean meat in their bodies.

There is another kind I want to tell you about that has legs about twice as long as this Berkshire. He has a sharp back instead of a wide back like this. What are they good for? They are good for bacon because they have more lean meat and not

much fat. Which kind do you like best—lean, crisp bacon or fat bacon?

And people in cities are just like you folks. They like lean bacon, too, that comes from the long-legged hog. Where is bacon cut from? It is cut from the lower part of the sides.

Everyone of you loves a horse. Everyone who is good for anything has a large place in his heart for a horse.

This picture is of one of the breeds of horses that we raise in Illinois more than any other of the farm horses. What is his name?

Percheron.

Why do we call him that? Because he first came from a French district called LaPerche, and so he has that name. He has a smooth body, well muscled, beautiful neck and head, and a very intelligent head. The colts are easy to teach and to break.

Courtesy of Ginn & Co.

A CLYDESDALE STALLION.

Here is the Clydesdale. He has a wide head and long hair. He is a strong horse and a wonderfully good plow horse. He is not quite so active as the Percheron, but there is no better plow or draft horse than the Clydesdale.

Suppose we had learned about these different breeds and knew which would make the most money, still there would be a great deal to know after that about the way to take care of the animals. I know some men who have pretty good animals to start with, but the animals soon get to looking like the scrubs they had before.

And those men say that the pure stock business is all nonsense and they are going to raise scrubs again. Why is that? Because they don't take the right care of their stock.

I want to tell you the story of two little brothers. When these two little brothers were two months old and ready to be separated from their mother, one was put in one pen and fed corn alone until he was eight months old, and the other was put

Courtesy of Ginn & Co.

A Yearling Berkshire Sow.

in another pen and fed on corn and clover until eight months old. The one, fed corn alone, weighed seventy pounds, and the other, fed corn and clover, weighed two hundred forty pounds when eight months old. The only reason was that one had clover and one did not have.

Boys, some farmers feed pigs all corn and water. The corn fed to this pig (picture) was clean and the water was clean, and the corn wasn't shoveled into the mud. How much worse would it have been, I wonder, if the pig had had to root the corn out of the mud and drink muddy water? Sometimes pigs die. What makes them die? Sometimes farmers find dead pigs in the yard, and they say, "The pig has hog cholera." And the next morning there are two or three more dead,—and "More hog cholera," the farmer says. The reason the pigs died was the same reason that this pig was a runt. They were starved. If a boy had all the candy and cake he wanted to eat, still he would be starved. If he had all the potato he wanted to eat, and nothing else, he would be a runt, and couldn't get his lessons or run a race with the other boys. So, if a farmer has hogs he must not only have good hogs, but he must feed them properly. Why do you suppose that corn will not give the pig the food he needs to make him grow?

It is dry.

No, the pig had all the water he wanted. Let me show you some corn. A pound of corn nearly fills that bottle. Three-fourths of that corn, nearly, is starch and sugar. Starch and

Courtesy of Childs' Art Gallery.

A Dog Race at Ishpeming, Mich.—Which Enjoys it More, Boy or Dog?

sugar have nothing in them that will make bone or muscle on a pig or a boy or a lamb. So corn, you see, is made mostly of material that is of no good for growing a framework on the young animal, and if the animal can't grow a good frame, of course there is no place to lay on fat. And that is why some animals are stunted and small.

Some other feeds would have made more difference than clover hay. How much did this pig weigh? Two hundred forty pounds. Now Professor Dietrich over at the University has a way of feeding pigs that will make them weigh three hundred pounds when they are eight months old, instead of two hundred forty. You see that is one-third more. I will show you something that is a little like clover hay but very much better than clover hay, and see if you know what it is.

Alfalfa hay.

Yes. A good many of you may not have seen alfalfa before. We might say that it is first-cousin to clover, a near relative, but alfalfa is a better feed than clover. One ton of alfalfa equals one and one-half tons of clover, and on an acre of alfalfa we can raise five or six tons. On an acre of clover how much do you think we can raise? Two and one-half tons. Three tons is a big yield. And so we get only half as much clover and it is not nearly so good.

Children's Pets: A School Outline

By Elliot R. Downing.

[The following outline has had repeated use in the grades. It is printed here so that it may serve other teachers and with the hope that it may receive criticism and provoke discussion. The early lessons are suitable for lower grades; the later ones only for the upper grades. They should be given in order as there is a sequence.]

The teacher needs to be careful not to impart information. It is much easier to tell a child what you want it to know than it is to compel the child to observe for himself. It is eminently more desirable to accomplish the latter object.

In this work it is imperative to have the animals themselves in the schoolroom for observation. The cat and dog may be brought daily by some pupil. The squirrel and rabbit may be kept in the school room for a few weeks during observation. A cage may be improvised from a large box and some inch-mesh galvanized wire netting. Do not use the wire mosquito bar for cages. Animals will gnaw off the paint with which it is coated, with disastrous results. Sawdust or dry earth spread on the bottom of the cage will add to the animal's comfort. A pan of drinking water should be provided. Feed rabbits and squirrels on dry foods—corn, oats, bread crusts, nuts for the squirrel and an occasional bit of lettuce or grass or other green stuff. This avoids offensive odors. Keep the cage clean.

Lesson I. *Feeding.*—Ask two or three of the children to bring their cats to school, not giving them anything to eat before they come. It is well to have more than a single cat to observe, as puss is likely to be more or less stage struck and refuse to eat in the presence of so many spectators. Have ready for this lesson two or three bones with a little meat upon them as a pork or mutton chop. Now give the cat a bone and let the children gather about quietly to watch her eat. While she is cleaning the bone ask appropriate questions to bring out significant points. Does she eat at once or does she sniff at the food and take a little time to inspect it before she begins to eat? Does she try to run off with the food? If so where does she go to eat it? How does she hold the bone while she eats? Does she use her claws to hold it? Does she stand up or lie down while eating? Does she eat hurriedly or slowly? Does it disturb her to have you move around while she eats? Does she bite off the meat as you would bite it off a bone or as you would bite corn off a cob? What teeth

does she use? Could you use the same teeth to bite with? Does a cat chew her food well? Why does she lick the bone? When she licks your hand does her tongue feel soft and smooth like your own? Give a cat a few loose bits of meat or scraps of other food. Does she seize them quickly or deliberately? Does she stop to chew them well? Bring in a second cat while the first one is feeding. Watch their behavior. Give the second cat some scraps to eat near where the first one is feeding. What follows? Inquire of the children if their cats at home eat with other animals from the same dish.

At the close of the lesson, let several children tell what they have seen. Try to secure well stated expressions of the observations made. Commend those sharp eyed little people who see accurately. Ask for additional observations that children have been making outside of school, on the topic of the week. This is of much importance for we do not wish the study of nature to be considered merely a school exercise, but to be established as a life habit. It may require several attempts to secure satisfactory observations on the points above noted. There are no unvarying answers to these questions as there are to arithmetic problems and yet I am sure there will be almost unanimity.

Lesson II. *Feeding, Continued.*—As in lesson one, provide a bone and some scraps of food. Have some boy bring his dog to school. Be sure that it is hungry. Then feed it while the children watch. The same series of questions used for the cat may form the outline for the study of the dog's feeding. It will be unwise however to bring in a second dog unless there is an abundance for both.

Drinking.—After he has fed, give the dog a drink. How does he get the water? Watch to see the shape of his tongue as he laps it. Send some pupil to the board to draw the shape. Have pupils give their kittens some milk at home and watch to see how they drink it. Does a horse drink as a dog does? How does a cow drink? Do not fail to call for clear statements of the observations made both in school and out.

Lesson III. *Feeding, Continued.*—For this lesson have the squirrels and rabbits in the school room. It is wise to cover the entire outside of the box that you use as a cage, and not the open side only, with the inch-meshed galvanized wire netting or else protect vulnerable points with strips of tin. These animals are rodents and will gnaw their way to freedom and mischief in the schoolroom, if opportunity offers.

Watch the rabbits and squirrels eat. How does the squirrel

hold the nut? Does he crack it as you would crack a nut? What teeth does he use? What is their shape? Does he chew the nut well? Does he eat the nut where you give it to him or does he run off to some other part of the cage to eat it? What position does he take while he is eating? After he has eaten all he needs what does he do with other nuts you give him? Compare the rabbit's method of eating with the squirrel's. Can the rabbit hold food in its forepaws when it eats? Can you?

Take the pan of drinking water out of the cage and leave it out for several hours so that the animals will be sure to be thirsty. Then when the children are watching put in fresh water and observe the method of drinking. Compare with the dog and horse. From your observations do you think that animals get hungry and thirsty as we do? This will afford an appropriate opportunity for simple directions on the care of pets.

Perchance this work as outlined appears so commonplace that it will seem to some an unnecessary expenditure of valuable time on what is not only already familiar but also insignificant. But the careful study of these familiar matters will convince one that what is so commonplace is not always therefore well known. Moreover there is more of significance in these observations than one might at first think. There is a volume of ancestral history revealed in some of these apparently trifling mannerisms. The cat, for instance, you will find sniffs daintily of her food, eats leisurely and prefers to have her meal is seclusion. The dog bolts his food with all possible celerity, growling meanwhile at any possible interference and yet not seeming to be greatly disturbed by onlookers. One can see at once the inherited traits outcropping. The cats have always been solitary hunters. Her ancestors did not hunt together as the dog tribe has usually done. The members of the great cat family are accustomed through generations of usage quietly to partake of the prey which they have hunted alone and killed in the solitude of the forest or jungle. Not so the dog tribe. They have hunted in packs and when the kill was at last accomplished each animal seized his share, eating amid a jostling crowd of hungry fellows. Each secured the choicest morsel possible and defended it against all comers. Yet each was anxious to stow a large share of the plunder in the shortest time in that one spot secure from the claims of disputants.

This has not been suggested with the expectation that so much of philosophizing will be attempted with pupils of these lower grades but merely to give the teacher an inkling of what the observations we are now making may disclose.

LESSON IV. *Methods of Motion.*—Watch a cat move from place to place. Does she walk? Does she run? Does she go in any other way? Note particularly the crouching attitude assumed by the cat as she watches intently the moving object. Then see the few quick bounds with which she reaches it. Let the children watch the cat and then give the results of their observations.

Try putting the cat on a post or tree trunk and watch her come down. Coax her to climb by holding a piece of meat or other food, up on the tree just out of her reach. As she climbs, have the children observe how she does it. Does pussy climb as a boy would climb a tree? Let some boy climb to see the difference.

Now watch the dog as he runs about. Does he walk, run, jump, climb? How did you get the dog to come to school? Did his master just call him? Did puss follow her mistress to school or did she have to be carried? Watch the rabbit and squirrel to see how they move about. Does the rabbit walk or run like a dog? Watch the squirrel climb and see if he does it like a cat climbs. Have the children watch the squirrels and chipmunks in the woods now, out of school, and see what they are busy doing these days.

LESSON V. *Cleanliness.*—Let the cat have some milk to drink or a bone to gnaw and after she has finished watch her at her toilet. She usually cleans herself after feeding. How does she use her tongue in the process? What use does she make of her paws? Does she ever go in for a swim? Does the dog like to go in the water? Do you give your dog a chance to take a bath? Watch the squirrel and rabbit as they wash and clean their fur. During the week when this topic of cleanliness is being studied it will be well, whenever the squirrels or rabbits are cleaning their faces, to take time to watch them, putting in a short nature study period when the opportunity offers, as this process can not be produced at will as feeding time.

LESSON VI. *Sleep.*—Do dogs and cats sleep? Rabbits and squirrels? What position does the cat take when she sleeps? Where does she like best to go to sleep? Where does the dog prefer to sleep? What position does he take when asleep? What motions does he usually make before he lies down? Does the cat sleep much in the day time: does the dog? Have you a good bed for your dog? The animal's bed should frequently be renewed, for old straw that it may sleep upon, readily accumulates vermin. If the dog sleeps in a kennel, as it should, this should be whitewashed inside twice a year at least. It is important to keep the quarters that animals occupy in sanitary condition not alone

for the sake of their comfort but because when we make them our companions it is a source of danger to us, if they are diseased.

What becomes of the squirrels in the winter time? Do dogs like to be out of doors in the snow? Do cats? Will your dog run through the deep snow and frolic with you? Will the cat? Are rabbits out in the winter time? What do they feed on then?

LESSON VII. *Senses.*—Hide a piece of meat in the school room within easy reach, and let in a hungry cat. How long does it take her to find the meat? Ask the children to make a similar test at home. When the regular feeding time for the cat comes let her see you with a saucer of milk and then hide it while someone holds her and see how long it will take her to find it. Try a dog in the school room in the same way and see if he can find the meat as quickly as the cat did. Do not make the task too difficult but place the meat where it can easily be found, hiding it in the same place for the cat and the dog. Which do you find has the keener sense of smell, a dog or a cat?

Place the cat at one end of the room and roll a rubber ball across the opposite end. Make as little noise as possible in rolling it and let every one keep real still so as not to distract puss attention. Does she catch sight of the ball quickly? Make the same test with the dog. Does he see the moving object as quickly? Which can see farthest a dog or cat? Let the children devise and try some tests out of doors, at home with their cats and dogs to answer this question.

Stand, the length of the school room away from the rabbit cage and make some unusual sound like a low whistle. Do the rabbits prick up their ears and stare in your direction? Stand at the same distance from the squirrel cage and make the same noise, as loud as before. Do the squirrels hear it? Now repeat the test for both rabbits and squirrels, varying the intensity of the sound until you can decide which has the keener hearing.

It is probable that you will not have time for testing more than a single sense. It is better to repeat one test until satisfied that the results are trustworthy than to attempt several. More than a single test is suggested that choice may be exercised to suit the convenience of the teacher. This experimental work marks a step in advance of simple observation. The method of presentation is important. State the question to be settled to the pupils. Be sure that they understand it. Lead them by appropriate questions to suggest the test that is to be made. Assure yourself that they understand what is being done and what it is done for. Secure

from them at the close of the work a statement of the experiment and its result.

Lesson VIII. *Uses.*—Let the children tell what they can of the uses of the cat, dog, cow, horse, rabbit, squirrel. Tell them the stories of the St. Bernard and esquimau dogs and let them produce them.

The following are a few suggestions of sources of good stories:—Nesbitt's *Pussy and Doggy Tales,* Houliston's *Cat Tails and Other Tales,* DeLa Rame's *Dog of Flanders, Mother Goose Rhymes.* Old files of the *Youth's Companion* and *St. Nicholas* will afford good stories of these animals. Many of the child's poems of animal life have been set to music and may appropriately be used in connection with the nature study. *Mother Goose Melodies* published by McLaughlin Bros. contains *Pussy Cat, Pussy Cat, Poor Dog Bright, I had a Little Doggy,* and others. Equally good songs may be found in any standard collection suited to these grades. I should suggest that some pretty poem be memorized such as Jane Taylor's *Little Pussy.*

Familiarize the children with some of the good animal pictures and their artists. The following are suggestions:—Adam's *Kittens,* Landseer's *Dignity and Impudence,* Holme's *Kiss Me,* Troyon's *Oxen Going to Work,* Bonheur's *Cattle of Brittany* and *Horse Fair.*

Lesson IX. *Need of Protection.*—Need a squirrel be afraid of a cow? Of a cat? Of a dog? Of a rabbit? Why? (Recall food and feeding habits studied already). Need a cat be afraid of a squirrel? Of a dog? Of a cow? Need a dog fear a horse? Need a wolf fear a horse? A cow? Why? It is presumed that many of this series of questions will be answered from the observations that pupils have made.

Need a dog be afraid of another dog? A cat of another cat? Have you even seen squirrels or rabbits or horses fight? Continue similar questions to make clear the fact that animals frequently need protection from others of the same kind, quite as much as from their mutual enemies.

Why does not a rabbit freeze in the winter? Have you ever found a dead bird? What do you think killed it? Have you ever found other wild animals dead, such as squirrels, field mice, frogs, etc.? As a result of such questions it will be shown how essential it is that animals be protected from adverse physical conditions, such as cold, rain and storms. It is well for the child to realize not how strenuous the struggle for existence is among the animals afield, but that it is strenuous. It will lead to

many kindly acts. Crumbs thrown out at the door, a handful of corn deposited weekly in the same spot, a few nuts left always on the same stump, a crust of bread left every few days in the same place in the woods will not only help develop a thoughtful care for the unfortunate, but it will acquaint the child with the many unfamiliar birds that will come to his door yard for food. It will give him autobiographical sketches, unconsciously written in the tracks in sand or snow, about the spot he may choose for his beneficence.

Where do the wild rabbits live? Where do the squirrels live? What other familiar animals live in holes, in trees or the earth? Let the children discover the homes of chipmunks, gophers, ground hogs, musk rats or other animals, and watch their habits. Perhaps something can be learned of the structure of these houses and their uses as store houses for food, as well as places of retreat. This lesson adapts itself readily to a field trip. While going to a gopher field or a woodchuck's hole, the observations called for in the early part of the lesson could be made. Then while quietly seated waiting for the animal to come out of its retreat questions may be asked to cover other points. Ernest Ingersoll's *Wild Life of Orchard and Field* has some fascinating chapters on these common rodents and their homes.

LESSON X. *Means of Protection.*—When do cats, dogs and horses shed their hair and why do they do it? When do they need their heaviest coat? Where do the animals with very thick fur live? What are some of the animals whose fur man uses?

When a dog chases a cat how does she defend herself? (See Thompson Seton's Johnny Bear.) If a dog should run after a squirrel how could the squirrel protect itself? Could a cat escape from a dog by flight? Could a rabbit run away from a dog? Could it defend itself against a dog? How would it escape harm? Could a horse run away from a troublesome dog? How could a horse protect itself from a dog in another way than by flight?

In answering the above questions probably horns, hoofs, teeth and claws will be mentioned as weapons of defense. Name other animals besides those above that use claws; that use teeth for defense; or hoofs; or horns. Can you think of any other defensive structure besides horns, hoofs, teeth and claws? Do all the deer have horns? Which sheep have horns? Why do roosters have spurs when the hens have none? Can you think of other animals in which the males are especially armed with means of defense? Tell the story of the fight of the male to defend the young or the females. Such stories are to be found in Robert's

Heart of the Ancient Wood, Chap. VIII, "Red Dog" in Kipling's *Second Jungle Book,* "Lobo" in Thompson Seton's *Wild Animals I Have Known.* Some effective pictures to show just at this point are Landseer's *Deer Pass, The Combat,* Thompson Seton's *Krag, the Kootenay Ram.* Make emphatic this especial adaption of the male to protect the weaker females and the unprotected young. Lead the children to admire his reckless expenditure of strength and even of life in so doing. The natural pugnacity of the boy may be directed toward gallantry and the protection of the weak. This fighting instinct that sooner or later possesses every normal lad needs not repression but encouragement and proper guidance.

Lesson XI. *The Sense Organs as Protectors.*—The keenness of the animal's senses plays an important part in its protection. That animal escapes detection whose sharp eye, quick ear, and sensitive nose give it warning while the source of danger is yet a great way off. Recall the results of the tests suggested in previous lessons (Lesson VII) to determine which of these common pets has the sharpest sight, the most acute smell, the finest sense of hearing.

Compare the eye of the cat with that of the other animals we are studying. How does it differ from theirs? Do lions and tigers have pupils of the same shape? What other animals have such slit-shaped pupils? This form of pupil permits of very wide expansion and the animals that possess it are usually night prowlers, seeking their prey under cover of darkness or the forest's gloom. When you shut puss down the cellar to catch a mouse do you have to put a lamp there, too, so that she can see it? Does a dog like to be shut in the dark?

It is evident that these alert sense organs are important not alone to give adequate warning of enemies but also to assist in tracking and capturing the prey. Why is a dog used in hunting? When you play hide and go seek with your dog how does he find you? Does he follow you, nose to the ground or does he just run about looking for you. How does the hunter's dog find the game? The acute sense of smell of the noted St. Bernard dogs has saved the life of many a traveler. Tell the story of some hunt where the dog's tracking power has been important. A good one is to be found in the closing chapters of Chas. G. D. Robert's *Romance of Red Fox,* in *Outing* for September, 1905.

Man has largely lost his keen sense of smell because he uses it so little. It is said that savages, like the American Indians, when the white man first came to this country, would track their

prey or their enemies by the sense of smell. Now we use the sense of sight. Can you tell a rabbit's track? a squirrel's? Can you tell in which direction the dog is travelling from his tracks? Draw a dog's track. Can you tell from a rabbit's or squirrel's tracks which way the animal was going? Read *How Bunny Writes His Autograph* in Gibson's *Sharp Eyes.*

Notice that a dog's nose is cold and moist. Try this experiment with the school and then see if they can tell why the dog's nose is wet. With a clean handkerchief, wipe dry the surface of the tongue. Sprinkle a pinch of sugar on the dry surface and keep the mouth open. You will find that no sweet taste is to be noticed until the saliva has run down upon the tongue and dissolved the sugar. The terminal organs of the sense of taste are so constructed that only substances in solution can affect them. This is true also for the organs of smell. The gases which a flower gives off dissolve in the moist mucous membrane of our nose and then we smell the perfume. What other animals have moist noses? Do they have a keen sense of smell also?

Notice the reading of the thermometer in the school room. Then wrap a moist cloth about the bulb. In a few minutes note the reading again. Now can you tell why the dog's nose is cold?

LESSON XII. *Protective Color and Habits.*—The animal's weapons and senses are not its only means of protection. What is the color of the wild hare in winter? What during the rest of the year? What is the purpose of this change of color? What is the color of the squirrels in your neighborhood? Where do they live? What is the color of the tree trunks? What is the color of the deer's coat? Of the fawn's? Can you think of other animals of your own region that are protectively colored?

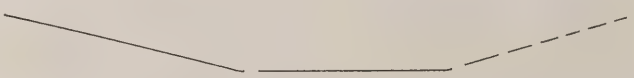
What is the color of a skunk? Of a hornet? Some of these animals that have a sting or other adequate means of defense are brightly colored in order to be conspicuous. The bright color serves to advertise their disagreeable qualities. Some of the great cats illustrate well another phase of coloration. They are colored like their surroundings not to save them from attack but so they can creep up without detection and capture their prey. The lion, inhabitant of the desert regions, has a coat of sandy hue. The tiger, lurking among the reeds and rushes of the river's margin, is striped with alternate bands of yellow and black. The leopard, jaguar and many other forest inhabiting animals, are mottled to match the sunlight and shadow on the forest floor.

Certain habits of these common pets, relics of their wild ancestry, are protective in their purpose. Do you ever see a

number of dogs on the street together? Do cats run about in packs? If one dog starts to chase a cow, what do other dogs that are near by, do? The wolves and jackals, wild progenitors of the dogs run in packs. Thus these animals not sufficiently strong individually, to resist their foes or pull down their prey, associate in packs or herds and so accomplish the desired end. Read chapter seventeen of Du Chaillu's *Land of the Long Night.* Which of the common domestic animals go in herds? Their wild relations do the same. Wolves will readily kill a single cow, but when the herd stands together with lowered heads the circle of horns effectually resists the attack.

Besides the stories already mentioned the following are suggested: *Mother's Wolf Story, St. Nicholas,* March 1903. *Lion and Tiger Stories, Republished from St. Nicholas,* published in book form by the Century Co. Porter's *Wild Beasts.*

Lesson XIII. *Structure of the Leg.*—Bring out by appropriate questions the fact that all these animals have head, trunk, tail and limbs. Do angle worms have these parts? Can you think of other animals that do not have them? Of some that do? Have the cat in the school room and let the children note the parts of the leg—the upper leg, lower leg, foot, toes. Does the cat have joints like we do? Notice the parts of your own arm—upper arm, forearm, hand and fingers? Does the dog have joints in its legs? How many are there in its foreleg? Are they similar to those of the cat's foreleg in number and position? Are they similar to your own joints at knuckles, wrist and elbow? Compare the foreleg of the squirrel and rabbit. How many joints are there? Are they similar in position to those of the dog and cat? Make an outline sketch of a person's arm and then of the foreleg of each of these animals to show the number of joints and the parts between joints. Then reduce these sketches to straight line diagrams in which the joints are represented by spaces and the structures between the joints by lines. Your own arm would be diagrammatically represented thus:



The wise teacher will correlate the drawing and the nature study at every opportunity. It is an imoprtant correlation—one that is beneficial to both subjects. To draw well one must see well. The observation training is a decided aid to the art instruction. And to insist upon the execution of a drawing is to insure some careful observations. The average pupil who exclaims in disgust, "I cannot draw!" would make a more truthful confession were he to say "I cannot see."

LESSON XIV. *The Hind Leg.*—Notice the cat's hind leg. How many joints does it have? Feel it carefully and see. How do these joints compare in number and position with those of the fore-leg? Study the hind-leg of the dog, squirrel and rabbit. Compare with that of the cat. Have the children sketch the hind leg and reduce to diagrams in the same way as already described for the fore-leg. Now let the children write a description of what they have each observed regarding the structure of the fore and hind legs of these animals. To hold one set of facts in mind and compare it with another and still another and finally with a whole series; to see a fundamental unity underlying superficial differences is to take a step in advance of mere observation. The goal will be reached when the children see for themselves that the legs of these several animals are built upon the same plan. The fact is not the goal, but having the children see for themselves is the desirable achievement.

LESSON XV. *Vertebrates.*—Let the children feel of the cat and dog to gain an idea of the skeleton. Feel the vertebral column, extending from head to tip of tail. Do horses and cows have a back bone? Do we? What other animals that you know have a back bone? Continue such question to lead the pupils to see that the back bone is characteristic of a great many animals, the vertebrates. Feel the ribs and breast bone; then note that the head is a bony mass. Feel the shoulder blade that fastens the foreleg to the body. When the cat is not standing on her feet, this bone, to which the foreleg is attached, may be easily moved about as it is simply imbedded in the muscle, not fastened to the other bones. Have the children demonstrate this to their own satisfaction. Feel the hip bone, to which the hind legs attach and which fastens, in turn, to the vertebral column. Are there bones in the legs? What is their relation to the joints that we have noted and diagrammed? Why does a cat have bones? Does an oyster have bones?

Is a cat's hind leg straight like yours? Have some of the children jump to show how the leg is bent in the process. Now, can you tell why the cat's hind leg is always bent so ? Watch the cat jump down from a table. How does she use the hind legs? On which legs does she alight? How does the way in which the foreleg is attached to the body make it easy for her to alight? How could the structure of the legs help the cat in hunting? Which has straighter legs, a dog or a cat? A horse or a cat? Which can run faster? Think of other animals that can run fast and far. Do they have straight legs or legs bent like the cat's hind leg? Make a list of the very speedy animals

and those vertebrates that do not run well. Note the length of leg and straightness of the leg.

LESSON XVI. *Structure and Use.*—How many toes has the cat? Dog? Rabbit- Pig? Cow? Horse? Why can puss walk so quietly? Feel the under side of her feet. Feel the dog's feet. Which are softer? Notice how the kitten uses her claws, how perfectly they are under her control. Where does she keep her claws when they are not in use? Can a dog sheath his claws? Which has sharper claws, a dog or a cat? Why? Recall how the cat and dog held the bone when gnawing it. Why does a horse have a hoof instead of claws? Dogs are used for hunting because they have a keen sense of smell (how did you prove it?) and because they can run swiftly and for a long time. Their relatives the wolves hunt in packs and run down very fleet footed animals. The dog or wolf chasing its prey over rough ground needs the firm hold that the constantly exposed claws give it. The cat does not chase its prey, but, we have seen (first lesson), creeps up stealthily and then pounces on it with a few powerful leaps. How is her structure well adapted to this? To what is the dog's straighter leg adapted? Does the rabbit's structure fit it for a long run or for a few quick leaps?

Notice that a hound's body is shaped like this when seen from the front **0** while a squirrel is like this **O** . What other animals have a deep narrow body? Think of others whose body is round. Can you tell why a hound's body is narrow and deep like a boat?

Continual care must be exercised by the teacher lest the nature study degenerates into the observation of unimportant details. Thus merely to have the children count the toes of cats, dogs, rabbits, squirrels, cows and horses is scarcely worth while if the work stops there. Let this be but the first step in the discovery of the significant relations between form and length of leg, number and character of the toes, speed and endurance of the animal and its habits of hunting or means of escape.

LESSON XVII. *The Head.*—Compare the shape of the hound's head with the shape of the squirrel's. The former has a long pointed head, the latter a compact round one. The reasons for this can readily be appreciated by older pupils. Feel on your own face the point where the lower jaw hinges. This can readily be done as you open and close your mouth. Now feel the cheeks as you bite some hard object. You can notice the location of the strong muscles by which the mouth is shut, as they swell in action. These are the muscles that a squirrel

uses as he chisels away the shell of a nut with the sharp front teeth. Think of the lower jaw as a lever, the fulcrum at the point where it hinges. The weight is the resistance to be overcome by the teeth in biting into an object. The power is applied by these jaw muscles we have felt. Have pupils draw a diagram of the long jaw of a hound and the short jaw of a squirrel, marking on each fulcrum, weight and power. Take a stick, like a ruler; fasten one end by a single screw to the wall or table and attach a weight at the other end. Tie a string near the middle of the ruler; run this up over a pulley made by putting a small spool or a nail in the wall; attach weights to the free end of the string to balance the weight at the outer end of the ruler, thus holding the latter horizontal. The apparatus will roughly represent the arrangements of mechanical elements in the squirrel's jaw. Notice how much power is required to balance the weight attached at the end of the ruler. Now use a longer stick; have the weight at its end and the distance from the fulcrum to the point of attachment of the string about the same as before. Do you need more or less weight on the string to hold the stick horizontal? Would it then be best for an animal that needed to bite hard like a squirrel on a nut, to have a short jaw or a long jaw? What sort of a dog can bite hardest? Has he a long or short jaw? Why does a hound have a long head? Compare a cat's teeth with those of a dog. Are they alike? Are they like your own? Are they like those of a horse or cow or sheep? How are the sharp, cutting teeth of the dog or cat well adapted to its method of eating? What do you feed a horse or cow? Why do they have flat-crowned teeth? State the relation of kind of teeth to the habits of the animal.

Note the position of the organs of special sense—eyes, ears, nose, tongue. Why are these sense organs on the head end? What is the use of a cat's whiskers?

LESSON XVIII. *Wild Relations.*—Observations in the lower grades (or with the lower grade outlines) have established some things from which we may draw extensive inferences. We have seen that the cat is a warmth-loving creature. She loves to lie stretched before the fire and curls up to sleep in the warmest corners. She goes out regretfully in winter and then gingerly treads the snowy paths. From these observed perculiarities what would you infer regarding the probable habitat of the great cats—her wild relations?

Have the children endeavor to form clear mental pictures of the following wild relations: fox, wolf, coyote, jackal, otocyon, bay

cat, cheetah, fishing cat, jaguar, lynx, lion, manuel, ocelot, ounce, panther, puma, rusty cat, serval, tiger, wild cat, yaguarandi. Have the children consult encyclopedias and natural histories to find descriptions of the appearance, habits and haunts of these animals. This is a good opportunity to drill on library work. Make use of available pictures, supplementary reading and personal observations by the pupils who have been to menageries or zoölogical gardens, to gain vivid conceptions of these forms. Recall the work already done on protective colors of the great cats. Do any other of these animals besides those there noted (third grade) illustrate the laws we there found?

Lesson XIX. *Distribution.*—Have each pupil draw an outline map of the world on a large sheet of paper (12x24 in.), or else provide them with the printed outline maps. Indicate by initial letter (L, lion, Ly, lynx, etc.) on these maps the habitat of each great cat. Thus the tiger is found in Arabia, Persia, India, Siam, Borneo, Sumatra, eastern China, Manchuria and eastern Siberia. In each of these localities put a T. Similarly mark the regions inhabited by the other great cats. The children have now collected and recorded the facts.

Lesson XX. *Distribution, Continued.*—A brief study of the map will enable them to discover the following facts: The great cats are largely confined to the tropics. The great majority are found in tropical Asia. Certain large areas, Australia, New Zealand, Madagascar, etc., are without the cat family. The tiger is confined between the coast and the great mountain ranges that run parallel to it, the Caucasus, Himalaya, Yang Ling, etc. The lynx is common to both northern Eurasia and North America.

Lesson XXI. *Laws of Distribution.*—Then begin careful quizzing for explanation of these facts. Why do you think the lynx is common to both Eurasia and North America? Why is the tiger not found in western China? Why are there none of the great cats in Australia? These and similar questions will lead the pupils to discover for themselves the laws of geographical distribution.

Animals appear to have originated at certain centers and have spread thence to occupy as extended a territory as possible. Tropical Asia seems to be the center of migration for the cat family.

In this migration certain conditions act as barriers more or less effective. What are they?

This method of procedure will take a deal of time and will be infinitely more trouble to the teacher than it would be to write these laws of geographical distribution on the board or refer the pupils to the proper place in their text books and have them learn them. But we are after mental stimulus rather than knowledge in our education, and surely nothing is more stimulating than the making of a discovery. To each pupil these laws may come with all the shock of a mental revelation even if the world does already know them. Therefore do not state the laws and use the map merely to illustrate them. Let the pupils continue work upon the map sufficiently long to discover them for themselves.

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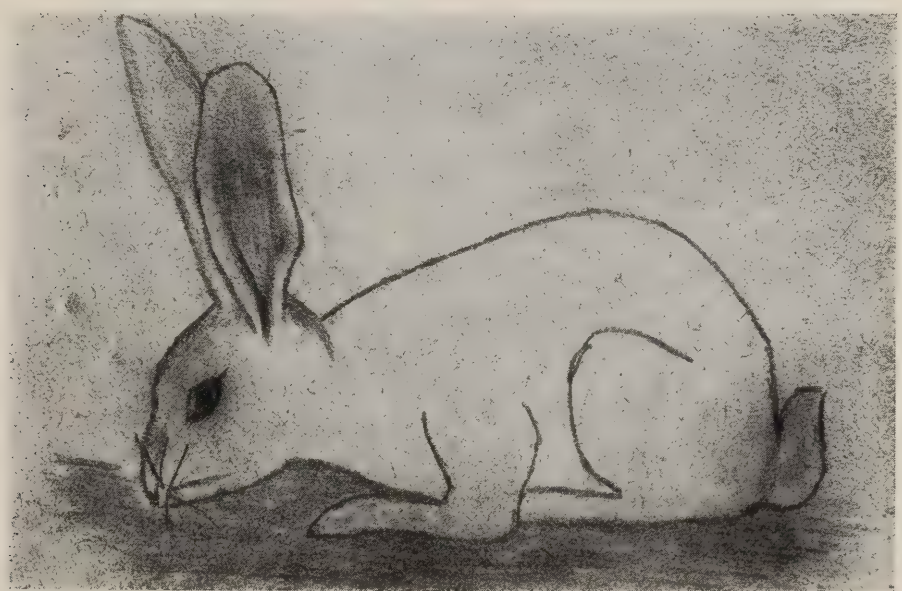

An Eight Year Old Child's Sketch of a Rabbit, From Life.

A Boy's Interesting "Zoo"

[The following letter is from a boy friend whose fondness for pets is very apparent.—Ed.]

DEAR DR. DOWNING:

I promised to write you about my animals, where I got them, where I keep them, what I feed them, and why I like them.

My turtle, a western painted terrapin about five inches long, which I found in one of the Washington park lagoons, I keep in a box about three feet long. There are three or four inches of sand in the bottom of this box, and a large pan of water set in the sand. I also have a brick in the pan for him to sun himself on.

At first he was very timid but after a few weeks he would eat worms, tadpoles, fishheads, small pieces of meat, etc., while I was standing near. If I laid a piece of meat or a worm on the brick he would seize it and go under the water where he ate it. One afternoon I got several tadpoles out at Homewood and put one into his pan. The turtle at once saw it and began an underwater chase after it. He caught and ate it, and I became so interested that before I knew it I had only two tadpoles left.

When the sun shone on the porch where I kept him he would climb out upon the brick and sun himself, until the air got cooler and then go into the water and just leave the tip of his nose extending above the surface. One cold morning late this fall I went out on the back porch and found such a thick layer of ice on the water that I could not see the turtle at all. I thought it was "Good-Bye Turtle" but I took the pan into the house and—a few hours after the ice had thawed out he was all right. I put his box which had been on the back porch down in the basement and in a few days I found him half buried in the sand and he has been there ever since.

The two tadpoles which I had left from those I fed my turtle were placed in my aquarium. They fed upon algae and any small bits of animal matter which they could find. Their hind legs appeared first and when their front legs started I placed a piece of wood in the aquarium for them to climb upon. A few days later one of them crawled out upon the wood. When he first came out his tail was not gone but it soon shrank into his body. A little later the other one completed his metamorphosis and crawled out by his companion. I kept a

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piece of lace curtain over the aquarium so that they could not jump out. They ate flies and sometimes a worm which I caught for them. When one saw a fly he would wait till it got within striking distance and then lean or jump forward with a quick movement and snap it up. When a frog was frightened he would either dive beneath the surface and rest on the bottom or hide under the piece of wood.

One day I caught a large yellow bordered water beetle in Jackson Park and put him into my aquarium with my frogs. A few days later I found one of the frogs badly torn to pieces so I promptly removed my beetle to another dish where he eats flies if I lay them on the water. When he wishes to breathe he pushes the tips of his wing coverts above the surface and so obtains air.

About the same time that I got the tadpoles this summer I caught one bullhead about six inches long and several small ones about an inch and a half long. I put them all in a large pan on the back porch. They ate worms, small pieces of meat, flies, etc. During the heat of the day the large one lay under the cabomba and other plants which I placed in the pan, and he would come out again in the evening. He must not have had enough to eat because he ate all of the small ones. When cold weather came I put him into the large aquarium.

One day out at Homewood I caught a crayfish six or seven inches long and put him in a pail of water where he shed his skin. I did not see him shed the skin on his tail but he seemed to back out of the rest of it. He shed every bit of it even that on his feelers and claws, but he died soon after this operation.

Sometime later I got another crayfish about an inch long at Stony Island. I keep him in my aquarium where he feeds upon bits of animal matter which he can find. He shed his skin three times, but each time he did it in the castle which I have in my aquarium and I could not see him. Several times he has climbed to the top of the castle and spreading his tail volplaned down to the sand. Once he "hooked" a ride on the tail of one of my gold fishes which jerked him about for some time before he fell off.

At the same time and place that I got my small crayfish I got several pond snails and a couple of trumpet snails. They feed upon the algae which grows upon the glass sides of the aquarium and sometimes the trumpet snails bury themselves in the sand.

My goldfish I bought down town. One of them is red with black on the end of his fins and tail and the other is red with silver trimmings. I feed them at a certain time each morning with a small quantity of fishfood. They also eat any small animal life which they find. Sometimes when the sun shines upon the aquarium they stay on or near the bottom. I have seen them take sand in their mouth and blow it out again probably to obtain any food which it might contain.

I also bought a couple of American Chameleons at the same time that I got my goldfish. I kept them in a cage made to fit over a potted geranium. They will eat flies and I have lots of fun watching them crawl over the wire cage and geranium leaves and branches. The largest one shed the skin on his tail a short time after I got him and a little later the skin on his back split open. He twisted and squirmed until he could reach it with his mouth and then pulled pieces of it off and ate them. When he shed the skin on his throat he extended his throat fan until the skin cracked open and he clawed it off. Their usual color is brown but when frightened or sleeping they are green. Every morning I sprinkle the leaves of the geranium with water and they lick up the drops.

Last but not least comes my good brindle bull terrier "Pat." He is a little over two years old and I've had him ever since he was a puppy six weeks old. He is very intelligent and we have taught him many tricks—he can sit up, speak, roll over, shake hands, pray and die. But I hope it will be a long time before he really does that.

As we live in an apartment I haven't as much chance to run a private zoo as I would like, but I hope to get a few more additions and when I do I will write you about them.

Yours very truly,

Chicago, Ill. W. H. DUCKER, Jr.

Editorial

Some of our noted biologists are today working with the children's pets. Animals once relegated to the nursery or the back-yard pen of the small boy are subjects for investigation by the keen minds of strong men. Castle at Harvard studies guinea pigs and rabbits; Davenport of the Carnegie Station writes volumes on chickens and canaries, the results of his researches; Professor Morgan of Columbia University spends years of work with mice and rats; the late Dr. Whitman of the

University of Chicago possessed thousands of pigeons, which had occupied him, profound scholar that he was, for fifteen years. Companions of childhood, to fascinate us with their pleasing ways and affectionate manners, our pets remain the associates of maturity to tax our best intellects with the unsolved problems they present, the complex laws they help us unravel.

That difference between the child and the savant—knowledge and ability which come from effective cumulative thinking—is a mark of the educated man. "That man . . . has had a liberal education . . . whose intellect is a clear, cold, logic engine . . . ready to spin the gossamers as well as forge the anchors of the mind." Any thoroughly educative process must needs include this among its aims—the development of thought power adequate to the problems of life. This can only be done with subject matter that has dependent continuity and a progressive complexity commensurate with the growing powers of the child. The classics acquired these essential educative qualities as they were knit together into a unified course of study by centuries of pedagogical selection. So, too, mathematics. In the unity of the course not in the subject matter lies the chief value as far as mental development is concerned.

It behooves us to remember these well-tried principles when we are busy these days constructing new courses of study. The farmer must make his living from his cattle, his grain, his fruits. It is eminently worth while that the boy who aspires to farm shall acquire skill in the scientific manipulation of these basal elements in his comfort, wealth and leisure. The miner must know his ores and associated rocks. The lad who follows this trade may well be schooled in practical ways that enhance his value as a workman. The muscles of the future crafts-man should early learn their cunning. But a wage-earning vocation becomes humdrum in the extreme and the lines of the average worker are laid in very prosaic surroundings unless his training shall so stimulate his thought that he can catch glimpses at least of the large significance of the commonplace.

The multiplicity of materials suited to nature study the country over and their diversity in different localities make unity in subject matter well night impossible. We must unify this diversity by the dominance of some idea—a hidden thread on which to string our separate lessons: only so can we hope to develop power. Then it must be live enough and large enough to hold and tax the ever growing mind of the student.

Books and Periodicals

School and Home Gardening. By C. H. Magee, S. C. Kelleher, and N. H. Foreman, Manila, Philippine Islands: Bureau of Education, Bulletin 31 (1910), 45.

Gardening as outlined in this bulletin is prescribed for all elementary schools in the Philippine Islands. The following subjects are considered: objects of school gardening, divisions of the work (school garden, home garden, nurseries, ornamental plants), selecting site, fencing, planning and plotting, preparation of the soil, choosing plants and seeds, keeping records, tools, transplanting, time, care of plants, disposition of products, germinating bed, cultural directions for thirteen common vegetables, seed for next crop, keeping seeds Barrio Schools. There is much in this bulletin of value for school gardening in the United States. The bulletin is well illustrated by plates and figures.—B. M. D.

School Gardens in Hawaii. By Vaughan MacGaughey, Southern Workman, July 1910 (Reprint pp. 11).

This report contains an account of the development of school gardening in Hawaii, characteristics, race factor, point of view (school, home market) management, list of vegetables, references, and outlook for school garden work. The fact that the school garden may be so readily adapted to the school conditions of our Island Possessions should encourage a greater use of school gardens in this country where better school conditions exist.—B. M. D.

Nature-Study. By H. L. Kent, Keene, N. H. State Normal School Bulletin (1911)), 51.

"The work in nature-study is intended to supply the child with carefully selected experiences which will contribute most to his development and put him in best relation to his environment." The practical application of this idea is discussed in the introduction to this bulletin. It is followed by a number of typical lessons worked out in considerable detail, *e. g.,* the radish (6 pages), seed testing (2 pages), apple-tree studies (11 pages), sanitation and hygiene (7 pages). The lessons presented are very suggestive as to method of actually presenting nature-study material to children.—B. M. D.

Nature-Study and Elementary Agriculture in California.

A conference on rural education was held at Davis, California, October 14th. A variety of educational interests were represented, including universities, normal schools, public schools, women's clubs, Grange, farmers, school trustees, and business men. A number of recommendations for the betterment of rural education to be presented to the next legislature were adopted. Among them were "immediate recognition of nature-study and agriculture by county boards of education" (1) by adopting for 1912-13 well organized courses in these subjects; (2) by providing for a county or district supervisor of nature-study and agriculture; (3) by better use of teachers' institutes with reference to nature-study and agriculture; (4) by rewarding successful teaching of vocational agriculture by a bonus to the teacher (the Ontario Canada plan); (5) by teachers' examination in nature-study and agriculture; (6) by division of the state into districts for better supervision and administration of instruction in nature-study and agriculture. —B. M. D.

Helps for California Teachers. In January, 1911, *The Country Journal* (San Francisco), a bi-weekly journal devoted to country life, added a department called "Agriculture in the Public Schools." Each number contains one or more lessons in nature-study or elementary agriculture prepared by C. E. Stebbins of the University of California.

Under direction of Professor Stebbins as department editor, *The Junior Call,* a portion of the Saturday Edition of the *San Francisco Call,* beginning October 14, devotes two pages to a Department of Nature-Study, School Gardening, and Elementary Agriculture, known as the "Junior Agriculturist."

Beginning with October 28th, *The American Weekly* (San Francisco) will offer a series of articles running through the entire year, on agriculture with special references to the public schools. The series will be prepared by R. O. Johnson of the Chico California State Normal School.—B. M. D.

In a recent educational publication occurs the announcement by Houghton, Miflin Company "of a new nature reader that will solve the nature study problem." Would that the nature-study problem were as easily solved! This little book upon which such great expectations are built is by Dellas Lore Sharp and illustrated by Robert Bruce Horsfall. Needless to say, therefore, it is delightful reading and attractive in its

pictures. It is a mixture of chapters descriptive of what the author has seen and done and of directions to the child as to what it should look for out of doors. The author himself appreciates the situation and Chapter 10 opens thus: "I have had many a person ask me 'What is the best way to learn about the out of doors' and I always answer 'Don't try to learn about it, but first go out of the house and get into the out of doors. Then open both eyes, use both of your ears and stand in one place stock still as long as you can and you will know the out of doors itself, which is better than knowing about it.'" And herein is expressed the difficulty with the nature reader. It so frequently leads teachers to give children something about the out-of-doors when they should go out of doors and the teacher even possibly believes that she is instructing in nature-stury. Chapter four on *Things to See This Fall* and Chapter seven on *Things to Do This Fall* are among the best in the book, but they are all too brief. The book is an excellent little supplementary reader, but it does not solve the nature study problem.

Through the kindness of Messrs. Ginn & Company, one of the articles of this number is illustrated by the reproductions of plates from *Plumb's Types and Breeds of Farm Animals*. It is an opportune time, therefore, to make note of the book in our review column. As the name of the book would indicate, there are taken up in succession the various kinds of animals that are raised on the farm. The history of each breed is briefly considered, its distinguishing characters are pointed out, the proper method of handling the animal and its excellencies and inferiorities are noted. It is hardly a book to be read throughout except by a breeder, but it is a very valuable book for reference. Charles S. Plumb is professor of animal husbandry in the College of Agriculture of the Ohio State University and ranks as an authority. It is not distinctively a nature-study book, and yet may well be added to the book shelf in those schools in which agriculture and nature-study are closely allied. The book is abundantly illustrated and very attractive in its appearance and style. ($2.00).

Nature Sketches in Temperate America is the title of a very attractive book from the press of A. C. McClurg & Company (price, $2.75)).

The author is Joseph Lane Hancock, a Chicago physi-

cian, who is an enthusiastic nature student and an authority on the Locusts. The press work on the book is all that could be desired and many beautiful illustrations, not a few in color, add to the attractiveness of the volume. Without being unnecessarily technical, the author has given a very clear statement of evolution by natural selection, illustrating the matter with reference to animals and plants that are usually familiar to the reader. There then follows successive portions of the book devoted to Adaptations in Animals and Plants, Protective Resemblances, Mimicry, Warning Colors—all treated from the strictly Darwinian point of view. This part of the book is admirably done, and even if one can not agree with the author in all of his interpretations, you must admit the accuracy of his observation and the charm of his narrative. The latter half of the book approaches nature from somewhat more recent view points. The sections on animal behavior and particularly that upon ecology are the ones to which zoölogists will turn with most interest. Nor will he be disappointed particularly in the section on ecology. Here the author is dealing with the group of insects with which he is particularly familiar—the orthoptera—and he makes a decidedly valuable contribution from the scientific point of view as well as a chapter of much interest to the uninitiated layman. Withal, it is a very excellent book to add to one's shelf of nature books and one that will be a stimulating companion for summer rambles.

Physicians seem quite prone to take to the woods and fields for their recreation. A second book by a physician is that by George T. Stevens, an *Illustrated Guide to the Flowering Plants of the Middle Atlantic States and New England,* published by Dodd Mead & Company. The purpose of the book is expressed in its preface, namely, "To furnish a hand book to the very large and ever growing class of educated people who are interested in the study of this most attractive branch of natural history, but who, by reason of unfamiliarity with the technical terms, have absolutely no adequate aid in the prosecution of an agreeable and refining pursuit." And in this task the author has usually succeeded very well. It is evidently difficult, however, for a man who is himself very familiar with the scientific terminology to refrain from its use and almost any page of the book will give examples of rather technical phraseology. Still the book is in relatively un-

technical language and in that respect is markedly different from the ordinary handbook which undertakes to describe and give analytical keys for our wild plants. Page after page of illustrations, reproductions of the author's drawings, add to the value of the book. These are not so numerous as in the well known Britan's *Illustrated Flora;* nor could that be expected in a single moderately sized volume. But the book will undoubtedly be of great help to the class of persons it is intended for and should facilitate a familiarity with the plants of one's region. It seems particularly appropriate to review the book in a nature study periodical, because it does simplify the process of recognition and does lead on to a moderate familiarity with some of the absolutely necessary scientific terms. It is a thoroughly praiseworthy attempt to popularize botany.

The first of the book has a context much like the Gray's lessons but less technical and better illustrated. The second part is devoted to the analytical keys and systematic descriptions. The keys are illustrated—an innovation the novice will appreciate. It makes an ideal text for high school use but is limited somewhat in its usefulness since many of the characteristic flowers of our prairie regions are not found in it. It should have large adoption in the territory for which its title indicates it is intended.

A very excellent little book is H. W. Conn's *Bacteria Yeasts and Moulds in the Home,* Ginn & Company. ($1.00).

The book is designed as a textbook for the schools; in addition to numerous interesting chapters it has an appendix with practical exercises. It is illustrated with numerous well executed cuts. The book might be used in high school or even with beginning classes in more advanced schools. It is eminently adapted to classes in home economics. It does not presuppose any previous knowledge of bacteria or bacteriological technique and the layman will read it with unalloyed interest, as it answers so many of the questions that he is anxious to have answered in a simple way. For instance, here he finds a clear discussion of the decay of fruit, with illustrations of the apple infected by the various molds producing those blotches that so often mar the fruit. Here he finds why various cheeses differ in their taste and why it is impossible for us as yet to manufacture some of them in this country. He finds the part that bacteria play in the fertility of the soil. Similarly the house wife will learn the philosophy of many of the common

domestic processes that she uses in a mechanical way without perhaps knowing the reason therefor. Not the least suggestive chapter is that on practical suggestions which applies the knowledge gained to the avoidance of disease in the common daily living. Withal the book is a welcome addition to the texts serviceable in study of the lowly plant from the practical point of view.

W. E. Castle's recent volume entitled *Heredity* is an excellent illustration of how deeply one may be led into the profound problems of science by a serious study of children's pets. The book deals largely with guinea-pigs, rabbits and white mice. It is a discussion of the experimental studies which have created our exact knowledge of heredity. Castle has himself contributed largely to this knowledge by his own work in breeding. The results are not only illuminating to the scientist from a theoretical point of view but of immense practical importance to the breeder, giving him a foundation of fact by means of which existing strains may be improved and new breeds created. The introduction states the problem of the new science of genetics. The first chapter emphasizes the duality of inheritance, the distinctness of paternal and maternal elements. Chapter two states clearly some evidence for the principle which Castle and many other biologists maintain that the germ plasm, the hereditary substance, is quite independent of the rest of the body. Chapter three discusses Mendel's law, the basis of our knowledge of this subject. Succeeding chapters give a resume of the modifications of this law since its rediscovery in 1900. The book is well illustrated with pictures of the animals that have served Castle so well in his investigations; some of these same animals are shown in cuts illustrating Professor Castle's article in this number of the Review. The book is concise, lucid and accurate, giving the lay reader a vivid notion of the present state of our knowledge of heredity. It is not a nature-study book in the sense that the material in it will furnish subject matter for grade work. It will give the nature-study teacher an outlook, however, into the regions whither her subject leads and an inspiring contact with the keen mind of a man who stands on the firing line of scientific advance. Such broad visions are needed even to teach elementary science most efficiently. [D. Appelton & Co., $1.50.]

THE

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DEVOTED PRIMARILY TO ALL SCIENTIFIC STUDIES OF NATURE IN ELEMENTARY SCHOOLS

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Annual Meeting of American Nature-Study Society

The annual meeting of the American Nature-Study Society will be held at Washington, December 27th and 28th, 1911, in connection with the meeting of the American Association for the Advancement of Science.

The meetings will be held at the BUSINESS HIGH SCHOOL building.

The headquarters will be at the NEW EBBITT HOUSE, corner of 14th and F Streets. (The rates are $1.50 per day, European plan, or $3.00 and up, American plan.)

DECEMBER 28TH 2 P. M.—*General topic—Relation of the American Nature-Study Society to Various Aspects of Nature Study. How may all these interests be best served by the Society?* Remarks limited to ten minutes. Speakers on the *general topic*—M. A. Bigelow, F. L. Holtz, C. H. Robison, Stanley Coulter. *School Gardens*—Otis W. Caldwell, V. E. Kilpatrick, Anna B. Comstock, M. Louise Greene, Louise Klein Miller. *Elementary Agriculture*—D. J. Crosby, E. E. Balcomb, F. L. Stevens. *Forestry*—E. R. Jackson. A general discussion of each sub-topic will follow. It is hoped to secure the widest possible expression of opinion relating to the policy of the Society.

DECEMBER 29TH, 10 A. M.—*Continuation of the discussion of the previous session. Earth Study*—D. C. Curtis. *Hygiene*—F. B. Dressler, W. S. Small. *Civics*—C. F. Hodge. Report of the President. Report of the Secretary-Treasurer and Editor of the Nature Study Review. Report of committees. New Business. Election of officers.

Tuberculosis Among School Children

George J. Nelbach.
State Charities Aid Association, New York City.

Tuberculosis among school children is more prevalent than is commonly supposed. Recognition of this fact has been made during the last five years and important constructive measures of discovery, treatment and prevention have been instituted in many cities in this country.

As Dr. E. L. Trudeau, pioneer in America of open-air treatment for tuberculosis, has well said, "the need of protecting the child is shown by the fact that about fifty per cent of children living in crowded districts become infected by the time they are five years old. Regulation of home conditions, better school hygiene, the segregation of actively tuberculous children, and open-air schools for those who have latent tuberculosis are measures that should be applied more extensively; the more so because the child shows a strong tendency to recover, and the application of open-air methods seems even more effectual in children than in adults in preventing and curing the disease."

The figures of Pirquet, Hamburger, Lowman, Philip and many others show that over 90% of the children in poor districts are by the time they are fourteen years of age already the seat of tuberculous infection. This statement appears in an article on "Conservatism in Tuberculosis Work" by William Charles White, M. D. of Pittsburg in the December number of the "Journal of the Outdoor Life."

In New York City one thousand children die annually from tuberculosis, according to the Department of Child Hygiene of the Russell Sage Foundation.

Additional proof of the prevalence of the disease among children has been revealed through special physical examination of the children in families in which the disease exists or has existed. An examination of 150 such children in New York in 1908 brought out the fact that 51% showed positive signs of the disease, while in an additional 20% a definite diagnosis could not be made, but suspicious symptoms were found to be present. A somewhat more extended investigation took place in Boston, where 679 children taken from the poorest homes were examined. Four hundred and seventy of these homes contained living consumptives and in 179 others there had been recent deaths from the disease. Of the children ex-

amined, 36% showed definite signs of pulmonary tuberculosis, and more than 66% of the entire number showed symptoms of the disease. Of 321 children living amid poverty and neglect, who were examined on account of suspicious symptoms, about 30% were considered tuberculous, although there had been no direct exposure in the home.

HOW CASES ARE DISCOVERED.

The system of medical school inspection is most important in affording a means for the discovery of cases of tuberculosis among the children. An inquiry addressed to the 1285 cities in this country having organized systems of graded public schools under superintendents, and sent out by the Department of Child Hygiene of the Russell Sage Foundation brought

—Courtesy Chicago Tuberculosis Hospital.

out information from 1038 cities with reference to what is being done by them for the discovery of tuberculosis and other communicable and contagious diseases, for the detection of physical defects and what preventive measures if any were being employed. 43% of this number have medical inspection,

a really remarkable showing, when one considers how recently this procedure was generally regarded as an experiment or a fad. The plan was first tried in 1890. Eleven cities had adopted it by 1900; 55 by 1905, and 443 by 1911: 214, or about one half, include in this system of inspection such thoroughgoing, complete examination as would reveal physical defects and organic diseases, including tuberculosis.

Special children's clinics have been established in a number of cities in connection with free dispensaries, where certain hours or days are set aside solely for the examination of children. The clinic for children, as distinguished from the general clinic, has been deemed advisable because diagnosis in children, especially of tuberculosis, is distinctly a specialty and, furthermore, there is a marked difference in treatment. There are 25 or 30 dispensaries in the country that are conducting special children's clinics and the majority of these are in New York City. Most of them have a special staff of physicians for this kind of work.

In some cities, where there is no system of medical inspection of the school children by physicians, a special nurse or nurses have been provided to examine the children for defects, and upon the detection of defects to refer the children to the family physician for diagnosis, or to the district physician, if there be no family doctor. The school nurse, through her training and experience, will frequently suspect that a child has tuberculosis and will see to it that the diagnosis is made.

TREATMENT.

Should a child on examination be found to have open tuberculosis, that is, to have advanced disease and be for that reason, a menace to his classmates, he is excluded from the school and is, wherever possible, removed to a sanatorium or tuberculosis hospital. Fortunately, open cases of tuberculosis among children of school age are not frequent. The majority of cases diagnosed as tuberculosis are those in which the disease is present in the bones, joints or glands, or if pulmonary, is in the incipient stage. It is to these cases that most attention is being directed with reference to treatment.

The Association for Improving the Condition of the Poor of New York City has maintained for a number of years at Seabreeze, near Coney Island, an institution for the treatment of tuberculosis of the bones and joints. Such remarkable results have been secured that it has become well known all over

the country. A similar institution is in operation at East Greenwich, R. I., during the summer season.

The open air school affords another means for treating tuberculosis in children. Attendance at schools of this kind is not confined merely to the children having the disease, but to those who are anaemic or are pre-disposed to tuberculosis. A school of this kind was recently opened in Pittsburg through the efforts of the Civic Club at which but four of the twenty-two pupils enrolled could be classed as tuberculous. The others were anaemic, or pre-disposed to the disease.

The first open air school was established in Germany in 1904, and in 1909 one was opened in this country. Since then twenty-seven other cities have provided schools of this kind, and practically everywhere they have been successful. The children have improved physically under the outdoor treatment, the average gain in weight varying from one half pound to one pound per week. The surprising feature of the measure is the fact that although the children spend but half as much time in study as do the regular classes, they have been able not

—Courtesy of Civic Club, Allegheny Co, Pa.

EACH DAY THE CHILDREN HAVE A HOT LUNCHEON AT TWELVE O'CLOCK, THE MENU IS PREPARED IN THE DIET KITCHEN AND CHANGED EACH DAY.

only to keep up with the regular school schedule, but in many cases have overtaken their classmates who were in good health.

The children do not refuse or even object to the out-door school. Indeed they want to go. They like it! There they are allowed more play, given less study and have three wholesome meals a day—a program not enjoyed by their fellows in good health. The distinctly favorable attitude of the children toward open air schools was brought out in Chicago, where they refused to stay away from school during the Christmas vacation and demanded that they be allowed to attend as usual. Such a plea was irresistible and the school authorities yielded.

It might be expected that parents would object somewhat to having their children classified as physical incompetents, but the city of Rochester, in its report to the Bureau of Educa-

—Courtesy of Civic Club, Allegheny Co, Pa.

THE PERIOD FOR PLAY IS SHORT BUT FREQUENT, IN ORDER TO GIVE THE CHILDREN THE EXERCISE NECESSARY TO KEEP THEIR BLOOD IN CIRCULATION.

tion at Washington, stated that almost without exception the parents were not only willing, but anxious that the children should be enrolled in the open air school.

Most effective treatment for children in the pre-tubercular stage is offered at the Tuberculosis Preventorium for Children at Farmingdale, N. J. This institution has a capacity of 30 beds for patients between the age of four and fourteen years who are surrounded in their homes by individuals who have active tuberculosis. There are no charges and admission is secured through the clinics in the New York City and Brooklyn Associations of Tuberculosis Clinics. The patients are given the customary institutional treatment and as they are under the sanatorium regime for several months at a time, greater results are secured than are obtained at outdoor schools.

GENERAL PREVENTIVE MEASURES.

Not only is the open air school effective through accomplishing its direct purpose with the handicapped children, but it has a far reaching influence on the health of those who are normal. It has led to instituting better ventilation in the school buildings and its educational influence is carried into the homes by the children.

Another important general preventive measure is the abolition of the public drinking cup. Massachusetts has passed legislation prohibiting its use and the schools in that commonwealth are now provided with sanitary drinking fountains or with individual drinking cups. The inquiry to which allusion has been made and which brought replies from 1038 cities revealed the fact that 785 have installed sanitary drinking fountains, and 264 are furnishing individual cups. There are some cities represented in the figures that are using both. All duplicates considered, however, there are 875 cities employing either one or both of these measures.

The feather duster is being gradually driven from school use. Over 60% of the 1038 cities from which reports were received are now using moist cloths for dusting purposes, and 90% are using dust absorbing compounds for sweeping. At the forefront are 87 cities that are cleaning their school rooms by means of the vacuum cleaner.

It is out of the question to safeguard the health of a child by exercising the proper precautions in the school building, for the child spends but a small portion of his time within the walls of the school. The child needs instruction along the line

of prevention. This instruction is being given in the schools of 649 of the cities replying to the inquiry previously referred to.

This instruction generally covers the extent of the disease, so that the child is impressed with its importance; second, with its nature, emphasizing especially the fact that a lower vitality means a fertile soil for the germ; third, the way in which the germ itself is communicated from the sick to the well; and fourth, the measures necessary to secure control over the disease.

Another educational factor of prime importance is the school nurse. She is the connecting link between the school and the home. Her duties bring her in contact with the family and with the neighborhood. Thus she has a splendid opportunity for disseminating information about the principles of right living, sanitation and hygiene.

In this present day and age the authorities are coming to recognize their responsibility for the health of the children. School authorities in particular are recognizing this responsibility and acting upon it. By insisting that a child attend school for a certain number of hours each day and for a certain number of years the school authorities place themselves in a position where they can at least morally be held to account. When parents surrender a child to their keeping they have a right to expect the child to be returned to them at the expiration of his school life in as good condition as he was at first.

Hygiene as a Sixth Grade Subject

C. F. Phipps.

The University of Chicago, the School of Education.

Health teaching is often divided into two factors: (a) hygiene—the healthful conduct of the individual; (b) sanitation—the maintenance of an environment favorable to human health. Instruction in hygiene should have as its aim "a healthier, happier and more useful life," but too often this aim is neglected. The public as yet is not fully awake to the importance of more and better instruction in hygiene, and for this reason the subject has not received the at-

tention it deserves. It is true we may get much encouragement from a comparison of the teaching of the subject today with former conditions. On the average physiology and hygiene are now required studies in six or seven of the eight elementary school years. It is doubtful however if much intensive health teaching, as defined above, can be given before the sixth grade.

When children reach the upper grades in the elementary school they have arrived at an age where a more intensive study of topics relating to their environments, their own healthful conduct, and to simple scientific facts may be made to advantage. In nature study work the aim in the lower grades is mainly to draw the child's attention to many facts of nature in order to acquaint him with the world in which he lives. At the sixth grade age the inquisitiveness of the child begins to assert itself more strongly, and he is no longer satisfied with mere acquaintance. At such an eager and impressionable age it is a suitable time to begin the study of a subject like hygiene which demands more intensive work.

To get the best results it is better to concentrate the work, covering it in one year perhaps, rather than making very feeble and infrequent attempts all through the grades. This would mean that more time than the usual two half-hour weekly periods should be given to the work.

The public is becoming more interested in this subject, and is desiring more and better training of the children in personal and community health. This increased interest is due partly to the fact that much has been accomplished in recent years in the improvement of public health. The advance in scientific knowledge, with the accompanying agitations and reforms, has emphasized the need of better training of the child in hygiene and sanitation.

Professor Huxley long ago truly said that "the learning how to meet one's environment constitutes a liberal education." Learning how to meet one's environment, and following hygienic rules are matters of education and habit, and boys and girls should be educated to form right and useful habits. Laws cannot make a community healthy, happy and useful; education is the fundamental basis of this, and such education should begin early in the life of the individual, but not too early for a proper understanding and appreciation of it. Children in the sixth grade are able to think for themselves, and hygiene trains them in better thinking when pre-

sented to them as a series of problems for discussion. Children may be easily appealed to, in plain and direct language, and shown how they may save themselves the results of ignorance or carelessness on their part or on the part of others. The truth about common living should be taught thus early in the child's life, especially as scientific research is bringing to light so much concerning sickness and health. Such teaching prepares the child to meet practical life as he finds it, and acquaints him at an impressionable age with the necessity of good health regulations. It gives knowledge concerning cleanliness, ventilation and sanitation which he can use in the home, both for himself and for others.

Some teachers assert that hygiene is too difficult a subject for sixth grade pupils, and should be deferred to a later period. It is true that much of the health teaching in this grade is too difficult, mainly because too much physiology and anatomy are presented with it. The latter subjects properly belong to high school and college curricula, but hygiene, properly taught, is no more difficult than arithmetic, modern languages and other subjects thought appropriate for sixth grade pupils.

Children must be drilled in school life in habits of health in order that they may practice them and realize that the health and efficiency of others with whom they come in contact depends much upon their own vitality. In athletics the boys and girls are drilled to stand up for their personal rights and why should they not be drilled to stand up for their health rights? There would then be more chance of their demanding these rights through life whatever their condition or station might be.

Although this subject can profitably be concentrated in one year it should not be separated from the nature study work of previous grades. An abrupt transition is not desirable for there is involved a continuation of the same process of acquainting the child with his surroundings which occupied so large a share of his previous education. One very effective way of connecting the study of hygiene to former work is through the medium of the garden. To supplement the garden work pupils may collect seeds, plants and weeds from their garden plots and investigate certain things concerning them such as their relation to soil, the number of seeds in a plant, the distribution of seeds, estimates of the probable number of seeds becoming new plants, area covered

if all should grow, and reasons why so many seeds do not bring forth new plants. In a very elementary way it is the study of the struggle of plants for existence. The same study in a still more limited way may be carried into the animal kingdom. Some common types of birds and fishes may be studied with reference to the approximate number of eggs laid each year, average number hatched, and causes which lead to the destruction of so large a proposition of the eggs and young. Next factors influencing man's struggle for life may be touched upon, and then might follow, as a logical step, the discussion of methods for securing and maintaining public and personal health, namely, the study of hygiene.

Undoubtedly the cause of such poor results in teaching hygiene is due more to wrong methods in presenting the subject to young pupils than to the particular grade or grades in which it may be taught. Hygiene deals with things of everyday life, and should be presented from that standpoint. The logical way for older students is to begin with the study of physiology and anatomy, learning about the framework of the body, the organs and their functions, the nervous system etc. Then a formal study of the care of the body, hygiene, would begin. But if this method were followed with children their interest would soon be killed, or probably very little interest would be aroused. They are interested in what goes on about them, and the method of enlisting their interest in hygiene is to take up the subject in the reverse order to that used with older students, beginning with discussions of things concerning their own experiences in matters of cleanliness and health. In this way an interest is awakened and kept alive, and later the child will ask the how, the why, and the what of things concerning his body, and thus he will approach from his own initiative the deeper branches of the study. This method of health teaching leads the child from the known to the unknown, a sound pedagogical principle. This method is emphasized in the report of the National Society for the Study of Education for 1910. To quote—"Since hygiene means habit, the general basis for the grouping of hygienic data (in elementary schools) should not be anatomical and physiological structure, but the activities that make health, whether they are personal, social or political. For example, all useful knowledge bearing upon the circulation of the blood should not be centered about the heart and lungs, but rather all facts likely to serve as a stimulus to the breathing of fresh

air should be grouped together, or all that tend to result in cleanliness of person and environment."

The methods of presenting hygiene have been improved very much in recent years for the attention of educators and the public has been drawn more constantly to the subject. Formerly it was taught in a haphazard manner, and to some extent, is now, and without the aid of a text-book. The text-books of today are far from ideal, because still too much emphasis is placed upon physiology, upon the effects of alcohol, tobacco, etc. and too little emphasis upon public and personal health.

Concerning alcohol and tobacco it is becoming the conviction of most educators that too much time is spent in teaching about their effects on the human system and that their evils are over-stated and over-emphasized. The child, in the first six grades at least, has very little interest in the effects of the narcotics and drugs on the system. Yet the matter should not wholly be passed over, but the plain truth, which is bad enough, should be told without sensationalism or emotionalism. There are more reasons, which can be brought to the attention of the child, for avoiding alcohol and tobacco in the interests of others, than for avoiding them for one's own sake. Many things do more harm than alcohol and tobacco, such as lax laws, a feeble enforcement of laws relating to unclean surroundings, impure milk and congested tenements. The craving for alcohol and other stimulants are partially caused by such conditions.

The practical application of hygiene teaching should constantly be made in community life. If it can be impressed upon the child that unhealthful communities and physiological derangements cause acts which lead to wretchedness, sickness, crime, a denial of pleasure and happiness, a depleted vitality, and useless expenditure of energy and money, the method of presenting the subject is not far wrong.

Care should be taken that the child's attention is not directed to his own body too much, for this often has the effect of disturbing his self-consciousness, and he is apt to imagine he has diseases, or worries for fear of catching them. The child may also develop a dislike for the whole subject. The emphasis should rather be placed upon the health and well-being of members of the home and community.

Another method which kills the interest of the child and gives him practically nothing, is to require him to memorize a

text-book. A book may profitably be used as a basis for discussions about things which happen in everyday life, and the interest of the child is easily aroused in such questions. Thus the lessons can be made a pleasure instead of a duty. Topics may be discussed in class and the children encouraged to make a little start in original observations. Such topics are, dairy conditions of the town; local water supply; disposal of sewage and garbage; conditions of the streets, back yards and public buildings; sanitary conditions of local grocery stores, meat shops, bakeries and candy stores; pure food laws; patent medicine; fly and mosquito extermination; ventilation; care of the teeth; defective eyesight; tenement house improvement; public playgrounds; summer health camps, etc. An important aim should be to induce the pupils to apply to life what they learn from day to day.

Experimental work is most helpful in this subject, for impressing the truths upon the mind, and giving opportunities for training the powers of observation and drawing inferences. In the limited space left for this article only a few suggestions can be given. The subject of ventilation is simply illustrated with a box having a sliding cover. A five-pound starch box answers very well. If the sliding cover is replaced with one of glass, and two holes bored at the top and bottom of each end and these fitted with corks, these will answer for the door and windows of a room. Short lighted candles, placed inside, representing people, will show the bad effects of carbon di-oxide and the need of fresh air. By different combinations of open and closed door and windows the lesson of the need for ventilation can be strongly impressed upon the class. A slanting stick in the box with candles placed upon it will show that those nearest the top or ceiling will first be effected. If the children are permitted to assist in the demonstration it will add much interest to the lesson.

The process of respiration can be shown as follows. Cut the bottom off a ten or twelve ounce bottle and tie sheet rubber loosely over the opening. Have two small rubber bags or balloons within the bottle connected to two glass tubes which extend out through a rubber cork. If the rubber sheet, which acts as a diaphragm, is forced in and out, the balloons will deflate and inflate.

The prevalence of molds and germs in dusty air, and the relative merits of dry and moist sweeping, may be shown by exposing cultures for a brief time under different conditions in the schoolroom and at home, and watching developments.

Children's Pets as Disease Carriers

Edith Prindeville.

Have you a pet cat or a pet dog? Was it a poor homeless waif which you adopted and saved from the Dog Pound, or starvation, or was it a prize-winner with a long pedigree? If it was a waif it is probably the children's friend, for the buffets of fortune which such an animal has experienced seem to indurate it to tail-pulling and rough-and-tumble playing, to promote a sweeter temper than many a pedigreed animal possesses. Yet this evenness of disposition should not insure the animal's immediate reception into the family circle and constant companionship with the children. For while many of us have lived with dogs and cats all our lives with impunity, numerous instances of the spread of disease by pet animals would suggest a period of probation for a newly acquired animal, especially in the case of what might be termed a waif or a mongrel, whose previous associates are less likely to be known than in the case of a pedigreed animal which has always been kept carefully secluded.

Hydrophobia is often feared from dogs, and it is not generally realized that this disease may be spread even more fatally by a cat. A case is recorded[1] of a journeyman painter in Birmingham, England, who was severely bitten in the hand by a cat. The wound was treated at a local hospital and healed, but three months later the man complained of difficulty in swallowing and an aversion to all kinds of fluids. He was admitted to the hospital with well-marked symptoms of hydrophobia and died a couple of days later. Bites from cats are rarer but also more dangerous than from dogs, because cats have a tendency to fly at and bite exposed surfaces such as the face and hands.[2] Such wounds are apt to be considerably lacerated and because of the many nerves close to the surface of the face and hands the infection is quickly spread.

The length of time it takes rabies to develop would especially suggest caution in acquiring a new pet. An infected dog may be introduced into a community and not develop symptoms of madness for a whole year. It has been shown by repeated observations[3] that "about eight per cent of infected dogs require from three months to a year to develop the disease." The disease may also be communicated by a dog which is suffering from the

[1]Brit. Med. Jour., 1897, 1, p. 1129.
[2]Jour. Am. M. Ass., 1908, 51, p. 2143.
[3]Indiana Med. Jour., 1908, p. 303.

initial manifestations, before characteristic symptoms have appeared[4].

It is not even necessary to be bitten in order to have the infection transmitted[5]. "Transfer . . . has occurred through a pimple, a slight abrasion of the skin, by the animal licking the part." This, with the possibility of a long period of incubation before the disease develops and of transmission before the animal shows marked symptoms of the disease, makes hydrophobia a much-to-be-dreaded infection. Some protection may perhaps be afforded by keeping our pets from mingling freely with strange animals, but the most effectual safeguard would seem to be that which has been successfully employed in England and on the Continent—a uniform law for the muzzling of dogs and a strict quarantine of several months duration in the case of animals brought in from other countries.

Diphtheria also may be spread by children's pets. A distinction is made between the diphtheritic disease which sometimes runs an epidemic-like course among large numbers of cats, and human diphtheria. But whether or not the former disease is caused by the same organism which causes human diphtheria, experiments have shown that it is perfectly possible to cause lesions in the cat by inoculations with the human diphtheria bacillus, and this bacillus has moreover been repeatedly cultivated from animals closely associated[6] with diphtheria patients. It seems to be well established that pet animals, especially cats, may be at least occasional carriers of diphtheria.

In 1905 the bacteriologist of the burgh of Govan conducted some investigations[7] into the possibility of diphtheria infection being carried by the lower animals. In two cases of diphtheria he examined the family cat and obtained bacteria corresponding in every respect to those of human diphtheria. In one case the cat had been in the habit of sleeping with the child, and in the other the child had been fondling the cat in his arms and kissing it. In this same burgh five other cases of diphtheria were traced to infection from a single cat. Three of the patients came from two families living in adjoining properties, and the other two from a house in an opposite tenement. In the circumscribed area of the back courts of these buildings there had been a stray cat which found a home in one of the families affected. This cat on exam-

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[4]Jour. Am. M. Ass., 1908, 51, p. 2143.
[5]Loc. cit.
[6]Ibid., 1908, 50, p. 2067.
[7]Lancet, 1908, 1, p. 1143.

ination was found to be suffering from post-diphtheritic paralysis of the legs.

In an epidemic of diphtheria a few years ago the spread of the disease was largely laid to rats and cats[8]. The sewage was contaminated by some unknown carelessness at the isolation hospital, and rats and cats which frequented a nearby sewer became infected, as was shown by cultures made from the throat and fur of the animals. The fact that people living in buildings farthest from the sewer suffered least from the disease was thought to strengthen the conclusion that the isolation hospital infected the sewer; the sewer infected the rats (or the cats directly, as was demonstrated in one instance); the rats infected the cats; and the cats infected the people.

Many of the cases in an epidemic in Portsmouth, England, were traced to infection from cats[9]. It was found that the cat in many homes was described as having had a "bad cold" before the children were taken ill with diphtheria, and in the animals themselves the Klebs-Loeffler bacillus (the cause of human diphtheria) was found.

Instances such as these, where the infection may be traced to the family cat or to a neighbor's cat, may be multiplied. Cases where a dog was the carrier of the disease are rarer, but have been recorded. In one instance some dogs were noticed to be suffering from sore throat[1] and to be presenting "signs very nearly approaching those of diphtheria, as described by physicians." Evidence of the clinical symptoms alone, however, would not be sufficient to establish a case of diphtheria, but further evidence is not lacking in two cases recently reported. In this instance[2] one of two daughters developed diphtheria, was immediately quarantined in a separate part of the house, and recovered on being given sufficient antitoxin. The other daughter was given a small dose of antitoxin as a preventive. After the recovery of the patient the house was thoroughly fumigated and a new house into which the family immediately moved was also fumigated before they entered it. In spite of all these precautions, however, the second daughter developed a light case of diphtheria, three and one-half weeks after the first girl had been seized. She also was quickly cured by antitoxin. The physician in attendance made a thorough investigation and fixed upon a pet dog belonging to the family as the source of infection in both cases, basing his conclusions upon the following facts.

[8]Jour. Am. M. Ass., 1909, 52, p. 439.
[9]Ibid., 1908, 51, p. 1022.
[1]Lancet, 1908, 1, p. 1143.
[2]Jour. Am. M. Ass., 1908, 50, p. 1192.

The dog had been ailing for some time and according to the symptoms described seemed to have had diphtheria accompanied by partial paralysis of the legs. The first girl had been feeding him pills for his indisposition and probably caught the infection a few days after the beginning of his illness. The dog could not have caught the infection from her as a strict quarantine was kept and the animal was not allowed in the house after she became ill. The second girl played with the dog almost constantly after her sister became ill, and is supposed to have caught the infection from him in spite of the small dose of antitoxin which had been administered to her three and one-half weeks previously. It was thought hardly possible that the infection could have come from the first girl, as conscientious gargling was kept up and a bacteriological examination at the time of the second girl's illness showed absence of diphtheria bacilli. But in the dog's throat bacilli were found from which typical blood serum and broth cultures were made and injected into two guinea pigs. Antitoxin was given to one pig but not to the other. The latter died and on examination was found to have developed a typical diphtheria membrane, while the formation of a membrane in the former had been prevented by the antitoxin.

The transmission of other diseases by children's pets has been suggested. M. Courmont, a French scientist, believes that he has established in his investigations[3] that typhoid bacilli may be carried in the alimentary canal of the dog without doing the animal any harm, while the contagion may be spread in the same way as by human carrier. It has been suggested also that animals might assist in the spread of infantile paralysis by carrying the fleas which may be the real treasmitters of the infection. Conn[4] favors this theory as best accounting for the phenomena in an epidemic in Middletown, Connecticut. Conn by no means thinks this theory established, and indeed further evidence to corroborate both this and Courmont's theory of the dog's part in the transmission of typhoid bacilli would be welcomed.

It can not be doubted, however, that, as evidenced by the cases cited above, hydrophobia and diphtheria may be and often are transmitted by cats and dogs. Precautions should be taken to prevent the animal's contracting infection, by keeping it from roaming the streets, for example, and new pets should be made to pass through a period of probation.

[3]Bull. de l'Academie de Méd., Paris, 1910, 63, p. 660.
[4]Rep. State Bd. Health, Connecticut, 1910, p. 115.

Seven Years of Child Labor Reform

Owen R. Lovejoy,

General Secretary, National Child Labor Committee.

When this Committee was formed seven years ago, there was no accepted national standard of protection against the abuses of child exploitation. The general public, indeed, had not awakened to a realization that such an evil existed, and except for the Consumers' League and a respectable number of enlightened individuals, child labor in America may be said to have been without an enemy.

Then rapidly, as public intelligence and interest are wont to grow, there swept over the face of the country the exciting news that child labor existed in America, that the coal mines, glass factories, cotton and silk mills, cigar and cigarette factories, and even our public streets were the scenes of hardship, danger and oppression to the tender bodies and souls of little boys and girls. At this point a group of the more calm and discerning of those who were horrified by the evil decided to band themselves together for the purpose of conserving this public interest and seeking to direct it into definite channels of activity, in order that the sentiment against child labor should not spend its force in futile denunciation, but should realize improvement through definite results.

From a membership of less than fifty people, the Committee has grown, in seven years, to a contributing membership of more than 5,000, who cover an annual budget of nearly $60,000. Twenty-seven state and local committees are affiliated and the Committee is in definite co-operation with educators, medical experts, jurists, reform agencies, relief societies, woman's clubs, trade unions, manufacturers' organizations, churches, and all agencies working for the protection of child life.

While we do not look upon the enactment of child labor laws as more important than their enforcement, or than the constructive policies which seek to provide the child, excluded from prohibited industries, the physical, mental and moral opportunities needed to develop efficient citizenship, yet the changes secured in child labor laws within the past seven years will perhaps measure more accurately than anything else the extent to which the public is awake to the importance of safeguarding the child.

1. During seven years five states passed their first law upon

this subject: Delaware, Florida, Georgia, Mississippi, Oklahoma, and the District of Columbia.

2. The eight-hour day has been established in Ohio, Illinois, Indiana, Nebraska, New York, Wisconsin, Colorado, Oklahoma, North Dakota, Kansas, and the District of Columbia.

3. Night work under sixteen years has been made illegal in Alabama, California, Delaware, Idaho, Indiana, Iowa, Kansas, Kentucky, Louisiana, Mississippi, Missouri, Nebraska, New Jersey, North Dakota, Oklahoma, Rhode Island, South Carolina, Vermont, Washington, and the District of Columbia.

4. A fourteen-year-age limit as the minimum for employment in industry has been established in the following states: California, Colorado, Delaware, Idaho, Iowa, Kentucky, Louisiana, Maine, Missouri, Nebraska, Pennsylvania, North Dakota, New Jersey, Tennessee, West Virginia, Rhode Island, Kansas, and the District of Columbia.

5. Departments of factory inspection have been established in Alabama, Colorado, Delaware, Kansas, Louisiana, Maryland, North Dakota, Oklahoma, South Carolina, Texas, Tennessee, Virginia, and the District of Columbia.

6. Methods of proving the age of children seeking employment have been provided in the following: California, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Michigan, Missouri, Nebraska, North Dakota, Oklahoma, Oregon, Pennsylvania, Rhode Island, Washington, Wisconsin, and the District of Columbia.

Meantime, compulsory education laws have been enacted or improved in a large number of states.

Alabama, Florida, Maryland, North Carolina, North Dakota, South Carolina, Virginia, permit the employment of boys of twelve years in mines.

Children under sixteen are still permitted to work at night in Arizona, Colorado, Connecticut, Maine, Maryland, Montana, Nevada, New Hampshire, South Dakota, Tennessee, Utah, West Virginia and Wyoming.

There are thirty-five states in the Union in which children under sixteen years of age may work more than eight hours a day. Recently there has been widespread complaint against confinement of children in poorly ventilated school rooms, where they spend the day in physical inactivity. Under the most objectionable conditions, the child is confined in school 1,000 hours annually. In Massachusetts the factory child is confined *2,912* hours a year, and in New York, where the eight-

hour day prevails, he is subjected to *2,496* hours' confinement. In Alabama a child of twelve years may legally work *3,120* hours a year, or more than three times as many hours as he can be confined in school in states having the nine or ten months' school year; while children of fourteen years may be employed seventy-eight hours a week or *4,056* hours a year. The total number of hours of daylight in the year, exclusive of Sundays, is 3,744, so that the manufacturing industries of this state may legally employ their fourteen-year-old children *312* hours of the night besides all the hours of daylight.

The fruit, vegetable and sea-food canning industries throughout the country remain practically exempt from all child labor restriction. A large number of states still employ young boys in coal mines and quarries. The regulation of street trades is chaotic. Hundreds of young girls and boys are being sacrificed in vaudeville and moving picture shows to the enterprise of theatrical managers and the ignorance of parents. The reduction of hours for children to eight per day—a standard already commonly recognized as reasonable for adult men—has been secured in only ten states, and it is significant that none of these boasts of textile manufacturing as a leading industry. Law enforcement and educational opportunity are almost lacking in many sections. Little school children, and even their younger brothers and sisters, in New York City, continue to bend over their hard tasks in stuffy, dim-lighted tenement rooms, at unseemly hours of the night, without violation of any law by those who employ them.

A Better Crop of Boys and Girls

William A. McKeever.

Professor of Philosophy in the Kansas State Agricultural College.

The greatest evil of to-day is the incompetency, the ignorance of parents, and it is because of that evil that others exist.—Mrs. Theodore W. Birney, Founder National Congress of Mothers.

This is a great age for the breeding of thoroughbred horses, hogs and cattle, but not especially an age for the improvement of the race of men. If an ordinary farmer chances to have a horse that balks in the harness or a cow that runs off the reservation he needs only to write to the nearest government experiment station in order to secure, free of cost, a carefully prepared bulletin

on the subject, and perhaps along with a helpful letter from a high-salaried expert. But if the refractory creature chances to be his 16-year-old son or his fledgling daughter, the perplexed ruralist must fight out the case alone, or aided only by a despairing wife.

Through government appropriations and private benefactions we are expending vast sums of money in the pursuit of wealth and in the hidden meanings of non-human nature. Just now we read that government experts are constantly at work patrolling the sea coast in order to make a careful study of the antics of the sportive clam, the elusive mackerel and the hilarious "bachelor" seal, but there is no publicly-supported effort to observe scientifically the interesting behavior of little children playing around the family fireside. We have scholarly dissertations on how to develop kindliness and good will in the recreant mule, and how to bring up in a successful manner the orphan calf, but those who have in charge the home development of the human offspring must grope in the dark for a successful way.

We require a long course of schooling for the teacher, the physician, the veterinarian; we offer advanced courses of instruction for those who would do well in the breeding and management of cattle, hogs, and chickens, but we have no course of training or any standard of requirement for those who are to engage in the complex and difficult task of rearing children in the home. Any young human pair—no matter how much diseased, how criminal in their habits or tendencies, how ignorant of things in general and of child-bearing in particular—may, if they so agree, become married and blunder away without help or hindrance in the work of bringing up a family.

Now that the National Breeders' Association is about to include a department of eugenics, it will not be considered a matter of sentimentalism for me to urge that there be instituted for prospective parents something in the nature of a course in matrimony. Let there be obtained by careful methods of study and inquiry a body of information as to what physical and mental and moral qualities are most satisfactory promises of efficient parenthood, and what types of temperament may be regarded as compatible. Inculcate these conclusions in the home, the school, the church and the other socializing institutions so that they will become a part of the common knowledge of the people. And then, before the youthful wooer has the occasion to become blinded with a passion for some ill-advised life mate he will have been guided intelligent-

ly into a search for a true, and likewise intelligent, companion of the soul.

EXAMINE THOSE WHO WOULD MARRY.

There is no good reason why those who wish to marry should not be required to pass a physical and an intellectual examination. I would have "entrance requirements" for matrimony in every state.

One of the principal reasons why parents continue to train their children by old-fashioned methods of guess, hearsay and superstition is that there never has been prepared and offered to them any authentic, scientific literature on the subject. The old hit-or-miss methods of farming and stock-raising are being given up to the exclusive use of those interested in rearing children, while the farmer and stockman take advantage of the methods worked out for them by the trained experts, yet there is no more fertile field for research and investigation today than that of the home life of children. Send trained men and women into this field to gather up the broken fragments of a possible science of child rearing and then place their findings in condensed form free of charge in the hands of all prospective parents. I can think of no better and quicker way of regenerating the whole race

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The above is an excerpt, printed by permission from one of a series of pamphlets issued by Mr. McKeever, known as the *Home Training Bulletins*. More than a million and a half of them are in circulation. Samples may be had for 2c each. The list now includes:

No. 1. *The Cigarette Smoking Boy.*
No. 2. *Teaching the Boy to Save.*
No. 3. *Training the Girl to Help in the House.*
No. 4. *Assisting the Boy in the Choice of a Vocation.*
No. 5. *A Better Crop of Boys and Girls.*
No. 6. *Training the Boy to Work.*
No. 7. *Teaching the Girl to Save.*

Heuristic Method in Hygiene

JOHN DEARNESS.

Herbert Spencer's pungent arraignment of the educational method of his day has exercised a marked effect on subsequent pedagogical literature. It was doubtless true as he declared that the matter and manner of education seventy years ago differed so widely from what they should have been that the right class of facts was withheld and the wrong class forcibly administered in the wrong way and in the wrong order.

His argument for such a revolution of the curriculum as would give the subjects of study a position and prominence in accordance with their respective values for complete living was irrefutable. The knowledge of physiology needful for the comprehension of its general truths and their bearings on early life is all-essential and should rank first in time and importance in any rational system of education. This dogma of Herbert Spencer's which was strange and new when he advanced it is now seldom disputed, but its acceptance is more obvious in the literature than in the practice of school management.

It is true that nearly every state and province that has an educational system gives hygiene a place somewhere in its list of studies. In this Province of Ontario it appears in the curriculum of the common school grades, but it has never been tho't worthy of study by the high school or "grammar" grades. For a few years a minimum of one third of an easy examination paper was one of the requirements for entrance to the high school grades. The matter prescribed for study and examination was not exceptionable; the reason for referring to the experience here is to show that this "all-essential" knowledge if communicated by the book and note (or the memoriter) method may be nearly valueless. An eighth grade class that had just written on a review answers to the effect that the liver secretes bile, weighs nearly 4 pounds, is the largest organ in the body and is situated immediately below the diaphragm were unable to locate it on being directed to lay the hand over it. They had no concept of the gall-bladder and bile was only a name to them. They knew the names and numbers of the different kinds of teeth, but only guessed when asked to lay a finger tip on one of their bicuspids. They could all state in writing the injurious effects of neglecting to clean the teeth, but only looked around at each other and smiled as children do sometimes on finding themselves caught when those were told to raise their hands who had brushed their teeth that day.

The examination for entrance to the high schools referred to above afforded abundant evidence of the inutility of mere talk and book-study in teaching (?) this subject. Examples like the following—not mere howlers culled from the papers of the most ignorant candidates—could have been collected in sufficient quantity to fill a book. "The process of digestion (a phrase from the question) causes headaches and much impure blood; fried potatoes often causes digestion." "It is easy to have curvature of the spine if you think about it when you are writing; one good way is to set the feet firmly on the floor and rest the left arm lightly on the desk." "When you are chewing gum in school you are apt to swallow carbolic acid from so many children's breaths." "A disinfectant is anything you catch by going where they are; measles and chicken-pox are disinfectants; when you have them you should stay in the house and keep warm and try not to give them to other people; pimples on the face are not disinfectant but some kinds are."

The printed text or dictated note doubtless contained the truth for persons with experience enough to image it properly, but for the child the result was too often an association of sounds with a confusion of vague and vanishing ideas. The evident uselessness of this experience had led some to advise the reduction of the instruction in physiology and hygiene to a few didactic preachments on such rules as brush the teeth, keep the skin clean, and swat the house-fly.

Taught by the Nature-study method the study of physiology and hygiene with enough of anatomy to make the instruction intelligible becomes at once highly useful as knowledge and cultural as discipline. When you come to think of it why is not a child's body as suitable a subject for nature study as a bird's or a kitten's? For the purposes of observation of and reasoning about structures, functions and performances, what advantages have the latter? Those people who confuse nature study with formal science may have an answer. They think of pickled grasshoppers, skeletons and anatomical dissections and then throw doubt on the practicability of teaching human physiology by the nature-study method in the common school grades.

To compare the effects of verbal, didactic instruction and of self-active investigation take for example a study of the teeth. Direct one class to open text-books, turn to the page, read it with your explanations, memorize the substance if not the very words of the statements. Supply the other class or have its members obtain their own supplies of grains of wheat or rice, pieces of

thread, strips of bread, to experiment and observe the use of the teeth in grinding the wheat, holding, breaking, cutting the thread, biting off the thread, etc. Use hand-mirrors (broken bits of mirror glass will serve), and finger-tips to have them examine the crowns, sides, insertion of their teeth. Use human teeth obtained from some obliging dentist or examples obtained at the meat market to rub down on a grinding stone, longitudinally and transversely, to show sections of enamel, dentine, pulp-cavity. Objectively illustrate acetic fermentation and test with litmus as a basis for inference that such process may take place in food adhering to the teeth. Treat a bit of limestone and tooth dentine with dilute hydrochloric acid to suggest the decomposition of the dentine by the fermenting food. Do all this, giving the pupils the language of appropriate expression as they proceed—terms with or after, never before, their appropriate concepts. By way of review, daily for several days afterwards, have the bits of mirror used to enable the pupil to report whether there is any food fermenting at the union of teeth and gums. The first class listened and learned; the second one did something to find out something. I believe the latter will have wider, clearer, firmer knowledge, be more likely to adopt the desirable practice of cleaning the teeth and will have developed power in the direction of carrying on investigations on their own account.

I am tempted to multiply similar examples of lessons based on the organs of sense and exercises to increase their serviceability, on the hand and foot, the muscles, the bones, the nerves, the skin, the blood, the throat, the lungs, respiration, food and digestion. But I have to close by stating that the objective material for the heuristic study of this subject will be found first and best in the children's own bodies and experiences, then on the living or dead bodies of the smaller, lower animals and in articles that may be obtained at the meat market. These materials supplemented in the higher grades with chemical and physical experiments and observations with hand lenses and the compound microscope of such phenomena as the circulation of blood in the frog's foot will be found nearly sufficient for a useful and satisfactory course. It is true that there are understandable facts that the pupils should know, but which they cannot be led to discover by their own investigation or which cannot be demonstrated objectively in the common school grades, hence mannikins, charts, pictures, and text books have their place. But in the main the subject can be well taught and should be taught by the nature-study method.

Children and Health

C. A. Stebbins.

Man and his environment are comparable to the ear drum and sound. Without the drum there is no sound. Without sound "waves" there is no drum functioning as such. Man is such a tense drum, ever reacting to the vibrations and sensations that reach him. He is entirely dependent upon his environment, with the brain as the refining influence. Without the stimuli from without, man would not exist. From an environment normally friendly to his needs, man at birth is thrown into another partly friendly, partly hostile, and indifferent to his wants. He may mark his environment as he in turn is marked by it. The narrower the surroundings the more a man's habits take the impress of them, hence the strong man will broaden and enrich his environment by learning. Education, after all, is a matter of broadening one's environment. It consists of annexing contiguous territory. The uneducated man is a prisoner in this little world.

The normal tympanum, or ear drum, receives stimuli which produce normal reactions and the individual necessarily reacts normally. Given a defective drum due to adenoids, for example, the stimuli are received abnormally, thus man to be a whole man must be first a good animal from the physical point of view. He must receive stimuli normally. His personality must be colored with health.

The world is out of joint somewhere when not one out of 100 people is living at his full efficiency because of minor ailments, such as dyspepsia, nervousness, neuralgia, sick headache, tonsilitis, etc. Minor ailments endanger one's morals and lower the threshold for major ailments. The cold may lead to pneumonia. Usually the cynic and the unhappy are looking through some minor ailment. "A man full of health is a mine jammed full of wealth" with endless lodes leading to happiness and morality, for a happy man is a moral man.

Not only do minor ailments levy their tax of unhappiness upon man but they cost him at the lowest one and one-half billions of dollars a year. Nine-tenths of these minor ailments are preventable. Nine-tenths of the twists given to his character are preventable. Essentially in developing a whole man, the matter of health is paramount.

These ailments may be prevented through heredity, public hygiene, and personal hygiene. In all cases, however, the responsibility rests upon the individual. One has little patience

with the pessimist who believes the world is against him, who poisons himself daily with bad air, who eats incorrectly and then impotently scourges nature.

Nature is just to us all. We desire to live happily with the least amount of friction. If we do not reach these desires it is usually our own fault.

We may not live correctly (1) because we do not know how (2) knowing how, we do not live up to that how.

Out of 442,287 children examined for defective vision, 100,000 were defective. Out of 458,965 children examined 29,350 had defective hearing. 4,518 out of 26,534 had adenoids. Defective eyes, defective ears, adenoids and other defects, each has a special effect and they all have a common effect on the developing child. Children are not getting a square deal. The child with adenoids, with defective eyes, or defective ears is scolded, punished, and ridiculed as an ignoramus until a sweet disposition is soured, the faith of the child-heart is blighted and another character is twisted. The school and in some cases the home, with their steam-roller method, produce another candidate for the juvenile court. The great majority of children who pass through the juvenile court are physically defective.

Health is the first essential for morality and good citizenship. The home and the school should work hand in hand in this matter. Just as the home in so many cases is failing to give the child its health right, so is the school. However, we have much reason to be optimistic for there is a tendency in the right direction for better health conditions in the school. Medical supervisors are in charge in many cities. However, the work of these men should not be so much to tell the boy he has adenoids as to prevent him from becoming thus defective. To work not so much with the abnormal child as to prevent the abnormal child. In other words, teach the home and children how to get fresh air, how to eat and bathe correctly, how to prevent the hundred and one minor ailments which twist the otherwise normal development. We would not treat colts as we do children. We would not turn colts into an alfalfa patch, yet we let children roam as they please from cheap candy to coffee and hot cakes, from the community drinking cup to public places laden with poisonous air. Habits are thus formed which place a continuous strain upon the system, paid for later in terms of dull eyes and white checks and in low morals.

In dealing with children one must (a) make them feel the

need of the work; (b) use active, living material; (c) give opportunity for motor expression.

Introduce the hygienic work with bacteria in mass effect; avoid the use of the microscope.

Bring a mushroom to class and study its general make up. Draw attention to the spores, countless in number. Blow some of the spores into space, noting their disappearance. In two dishes, one exposed to the air, place moist bread. Observe from day to day. This demonstration draws the attention of the children to the fact that the atmosphere is filled with minute germs.

The Hygiene of the Individual.—Prepare gelatin cultures as follows: To an eight ounce bottle three-fourths full of water add two tablespoonfuls of ordinary cooking gelatine and a drop or two of strained honey. Place the bottle in boiling water until all solids are in solution. Add with a stirring rod just enough ammonia to make the solution basic in reaction.

Sterilize test tubes, bottles, petri dishes, etc., which are to hold the cultures. An inexpensive sterilizer may be made as follows: Place in the bottom of an ordinary tin pail wire netting with the corners bent down so as to raise the netting two or three inches from the bottom. Add water to the depth of one and one-half to two inches. Place apparatus to be sterilized on this netting in the pail, and set over a flame, letting the water boil. Sterilize for thirty minutes. Pour the gelatine into the test tubes, etc., and sterilize. To be absolutely sure of perfect cultures sterilize for thirty minutes on three successive days. Bacteria in the spore stages are very resistant. Let the children do most of this work. Let the culture medium cool.

Sterilize a knitting needle or a hair pin by holding over a flame, rub across the teeth, remove the cotton plug of a tube, stab quickly into a test tube containing the gelatine medium, withdraw, and plug again with cotton. In a similar manner make "stab" cultures from the finger nails, from different places on the skin, from lead pencils, the common drinking cup and the many other instruments that are put into the mouth.

Press the lips to a gelatine medium in a petri dish, wash the fingers and again touch a gelatine preparation.

In a few days culture medium will be filled with bacterial growth impressing upon the children the need of cleanliness and other hygienic measures. Too much of one's environment goes into the mouth. Children are eating too many carbohydrates, too many soft foods. These ferment in the stomach and keep the teeth bathed in the acid environment producing an early decay.

Forty-five children out of sixty questioned, had eaten hot-cakes, syrup and mush for breakfast.

The cultures made from the fingers point to cleanliness of the skin, etc.

Hygiene of the individual:

a. Mouth.
   1. Teeth.
      a. Food.
      b. Care of first teeth.
      c. Cleanliness and brushing.
      d. Care of permanent teeth.
   2. Keep from bacterial contact.
   3. Throat.
      a. Examination.
      b. Washes.
      c. Exercises.
   4. Keep unnecessary articles out of the mouth.
b. Nose.
   1. Adenoids.
      a. Anatomy.
      b. Cause.
      c. Prevention.
         1. Dust.
         2. Irritation.
   2. Antiseptic washes.
   3. Breathe through the nose.
   4. Care of colds.
   5. Examination.
c. Eyes.
   1. Washing.
   2. Care in use.
   3. Care at birth.
   4. Examination.
d. Ears.
   1. Cause of defective hearing.
   2. Remove adenoids.
   3. Keep clean.
   4. Care in use.
   5. Examination for defects.
e. Skin.
   1. Cleanliness.
      a. Bathing.

2. Sunshine.
3. Exposure to air.

f. Stomach and intestines.
1. Digestion experiments.
a. Effect of chewing.
b. Starch to sugar.
1. Effect of acid environments.
c. Mix food in test tube.
d. Sugars and proteids in water for fermentation. Draw conclusion.
e. Digestion of proteids.
2. Foods.
3. Tea and coffee, alcohol, tobacco.

Hygiene of environment:

a. Air
1. Cultures.
a. Room in morning, noon, night. Ventilated and unventilated room.
b. After dry sweeping and moist sweeping.
c. Draw conclusion.

b. Water and milk supply.
1. Cultures.
2. Trace to sources.

c. The house fly, mosquito, etc.
1. Cultures.

Control of bacteria:

a. Antiseptics, poisons, acids, cold, absence from air, cleanliness.

Helpful bacteria:

a. Use in manufacture in clothing, cheese, butter, etc.

Prepare a flat bottle with the culture medium. Catch a house fly and let it walk about on the culture medium. Observe results from day to day. Such a demonstration is more eloquent than days of talking relative to the harmfulness of the house fly. Avoid letting air into the bottle.

Bacteria are so closely related to the health and happiness of the individual each class should spend at least two weeks of its school life in their study.

Be sure that the bacterial cultures are applied in the direction of conduct.

The Necessity of Water for Flies

W. C. Coker.

University of N. C., Chapel Hill, N. C.

In the January number of the Review Mr. J. S. Lozier makes an interesting observation on the necessity of water to the life of flies. When I read his statement that if no possible source of water were left in the school-house when it was closed on Friday that all the flies in the building would be dead by Monday, I was so surprised that I decided to make a checked experiment to test the need of flies for water. Four tumblers were fitted with covers allowing the entrance of air and in two of them were placed several pieces of soaked *Sphagnum* moss. The other two were left empty. Two flies were put into each of the tumblers except one of those with Sphagnum—which got only a single fly. On examination after twenty-four hours the four flies in the two empty tumblers showed a distinct loss of enthusiasm—the other three were as lively as ever. After forty-six hours one fly was dead in each of the empty tumblers and their two prison mates were very weak—one of these died within the next two hours, but the fourth, not being quite gone I decided to try to revive it. A bit of soaked Sphagnum was placed at its head and it drank greedily and long. After a few minutes it had shown a gratifying degree of convalescence, recovering sufficiently to walk actively about and even taking a flight. The three flies in the tumblers with Sphagnum were still active, but slower in their movements than at first.

Wet moss was left with the revived fly, but at the end of the third day (72 hours) it was dead, as were also two of the three flies in the two other water-containing tumblers. The only fly now alive was too weak to walk, but when a sweet boiled prune was placed at its head it sucked in the syrupy liquid and within ten minutes was making flights in the tumbler.

This experiment shows that house flies cannot do without water for more than 48 hours or without food for more than 72 hours at the temperature under which the test was made, which was about 70 degrees F.

About two weeks later when the temperature was unusually high (85 to 90°) the experiment was repeated, four flies being put in each of four tumblers—two tumblers with and two without water. In this case all the flies without water died within twenty-four hours and most of them within fourteen hours. Most

of the flies that had access to water died before the end of two days and none lived for three days. This experiment shows that at high temperature flies must have water very frequently, twelve hours' deprivation being generally fatal.

Editorial

Last year, we Americans spent, in round numbers, two hundred million dollars in patent medicines to dose ourselves for real and imaginary ills. We bought eight hundred million dollars worth of tobacco to soothe our over-wrought nerves. We paid the liquor dealers three thousand million dollars for stimulants. This prodigality has gone on in spite of the fact that, usually, there is a means of accomplishing the end desired in a much saner and safer and cheaper way. All about us, neglected, is benign nature with her effective balm, her soothing ministrations, her rejuvinating influences. We are beginning to realize that we have only to open our windows to let in the healing air, that nervousness, bat-like, is banished by good sun light; that a cold sponge and brisk walk are the most effective bracers.

Not the least significant aim of nature-study is to so stimulate the child's love of the out-of-doors, to so accustom him to companionship with Nature, that a habit of comradship will be established for life. I would have every child taught something of the stars that as a man he might call some of them, at least, by name and walk beneath the star-lit sky in company with them. I would have him come to know the trees and flowers that their dewy friendship might entice his mature steps into paths of pleasantness and ways of peace. I would have the lad know the beasts that serve him and their lesser kin that when the strains of strenuous endeavor come upon his later years he may still be lured into these haunts where he and they renew their strength. But above all I would have him come into close personal touch with some person, some rare teacher, who has learned to appreciate "Nature, the dear, old nurse" and who by his stimulating contact can impart his own contagious enthusiasm.

And if the pupil needs the healing, inspiring friendship with nature how much more the teacher! Teaching is one of the dangerous trades—so classed by the insurance companies; teachers are a bad risk. The percentage of deaths from tuberculosis, for instance, is greater among teachers than among any other professional people. The teacher owes it

to herself, the pupils, the community, to cultivate a friendship with nature which promises such large returns in refreshed nerves, increased vitality and added personal charm.

News and Notes

New Version of "Mary Had a Little Lamb."

Mary had a little cold
That started in her head
And everywhere that Mary went
That cold was sure to spread.

It followed her to school one day
(There wasn't any rule),
It made the children cough and sneeze
To have that cold in school.

The teacher tried to drive it out,
She tried hard, but—kerchoo!—
It didn't do a bit of good,
For teacher caught it, too.

—Dr. W. H. Allen, New York.

Federal Children's Bureau Bill.

The National Committee again introduced into Congress a bill for the establishment of a Federal Children's Bureau. It led the campaign, and its contributing members, their friends, churches, clubs and other organizations were unusually active in petitioning Congress and individual representatives for its passage. The bill was reported unanimously by the committees to which it had been referred in both the Senate and House, and was passed by the Senate unanimously; but the leaders would not consent to have it brought up in the House and the Sixty-first Congress adjourned without action. It was re-introduced in the last extra session by Senator Borah and Representative Peters. Hearings were given and just before the Congress adjourned the bill was favorably reported by the Senate Committee. Appeals to Congressmen in favor of the bill are now in order.

Write your congressman, urge the passage of this important bill.

Stamps or seals were first used to get money for the anti-tuberculosis crusade in Norway and Sweden in 1904. After being used in these countries for three years, as a direct result of the interest of Jacob Riis in this movement, the Delaware Anti-Tuberculosis Association, headed by Miss Emily P. Bissell, and the Red Cross Society of Delaware, combined in issuing a Tuberculosis Stamp. So successful was this campaign that nearly $3,000 was realized, and the next year, in 1908, the American Red Cross was induced to issue a National Red Cross Tuberculosis Stamp. From this sale, $135,000 was realized, that amount being almost doubled in 1909. Last year, for the first time, the sale was organized on a comprehensive basis, taking in all parts of the United States, and $310,000 worth were sold. In 1911, the slogan for the campaign is, "A Million for Tuberculosis from Red Cross Seals." Have you done your share?

Recommendations of State Country Life Committee.

To the Rural Education Conference, California:

Elementary Schools.

I. Immediate recognition of nature-study and agriculture by County Boards of Education in three ways, as follows:

(*a*) During the years 1912 and 1913, adoption in all agricultural counties of a well organized course in nature-study and agriculture for all grades below the high school; the work of the grammar grades to be closely correlated with the leading agricultural industries of the region and vocational in nature.

(*b*) The provision of county or district supervisors of nature-study and agriculture, who are to be paid by setting aside a certain percentage of the income of each school district. Until a new state law makes it possible these supervisors cannot be paid by counties out of unappropriated funds. They must be employed by agreement among the trustees of the several school districts interested.

(*c*) Provision for proper presentation of agriculture to teachers' institutes and county trustee conventions.

II. Increased attention to be paid to the preparation of teachers and supervisors of nature-study and agriculture by the state normal schools and the University of California.

III. Legislation covering the following points:

(*a*) Provision of a fund for the payment of a bonus to every grammar school teacher who, during the year 1913 or any succeeding year, shall, in the judgment of the proper supervising officers, successfully teach vocational agriculture.

(*b*) Beginning in 1914 candidates for the county teacher's certificate to take examinations in nature-study and agriculture.

(*c*) Provide for the division, not later than 1914, of all counties into districts for the supervision of vocational education, including agriculture, in the grammar grades. These districts should contain not more than fifty schools, preferably less.

HIGH SCHOOLS.

I. Provision for state aid to any free high school establishing a department of agriculture, home economics and farm mechanics, with courses extending over one or more years, $250 to be given toward the salary of the first special teacher employed for one of these subjects and $150 toward the salary of each additional special teacher employed.

II. Provision for state aid to any county high school establishing a department of agriculture, home economics and farm mechanics, with courses extending over two or more years, $500 to be given toward the salary of the first special teacher employed for one of these subjects and $300 toward the salary of each additional special teacher employed.

III. Provision of $10.00 per school per annum for the visitation, by a member of the Division of Agricultural Education of the College of Agriculture, of each school establishing and conducting a department of agriculture, home economics and farm mechanics, for which state aid is asked, providing that a report on each school is filed by said visitor with the State Superintendent of Public Instruction.

—E. B. B.

Book Reviews

School Sanitation and Decoration, by Severance Burrage, S. B., and Henry Turner Bailey. Pages xvi+224, with 51 plates and 28 figures. D. C. Heath & Company. Price $1.50.

This is one of the most attractive pieces of book making that has put in its appearance under the caption of *School Sanitation.* The fact that decoration is recognized as an essential part in the healthful environment of the child gives the authors a chance to emphasize this point by inserting a number of excellent plates and figures on properly decorated school rooms and the proper decorations for the school room. The body of the text contains good chapters on the subjects that one would expect treated in a book of this character, though the subject matter seems a digest of our good information upon these topics. Perhaps one should not expect any marked originality in a book of this size and character. The proper position and structure of the school building is discussed; its foundation, heating, lighting, sanitary care, and the furniture to be used. Then there are chapters on the decoration of the school room, with very excellent suggestions and a good chapter also on the artistic arrangement of school work, such as compositions and covers for children's papers. The chapter on the actual sanitary care of the child is brief and rather inadequate. It is an excellent book, however, for the superintendent to have at his command, especially as he plans new buildings or the adequate decorations of the old ones.

The Housefly, Disease Carrier, by L. O. Howard. Pages xix+312, with 39 figures. Frederick A. Stokes Company, New York. Price $1.60.

This is a very effective arraignment of the fly as a disease carrier with so much evidence presented that only a packed jury could bring in a verdict of not guilty. There are also added a number of suggestions in regard to means of execution and better still, further suggestions on the prevention of the appearance of such undesirable members of our society. The book is written in Dr. Howard's happiest style, is clear and convincing. It is a book that could well be added to every school library so that the children might have inculcated the really dangerous nature of this common household pest with the ultimate expectation that shortly we shall arise to the emergency and exterminate the animal. The book is a companion to Dr. Howard's previous volume on the mosquito, although the latter is published by a different firm.

Plant Physiology with Special Reference to Plant Production. Benjamin M. Duggar. pp xv+516, figs. 144. The Rural Textbook Series, New York, 1911. The MacMillan Co. Price $1.60.

All who regard with favor the campaign for the introduction of agricultural instruction into our schools should welcome the valuable assistance to be afforded by this new text book of plant physiology with its new view point of the application of this phase of science to the practical problems of plant production. This method of approach has naturally led to the introduction of topics not usually included in plant physiologies such as the light relations of foliage organs, the water requirements of crops, variation and heredity, and the relationship of plants not only to toxic root secretions in the soil but also to toxic solutions applied to vegetation for the destruction of fungi and weeds. These and other similar topics prove that the author recognizes the importance of the life problems of economic plants and of the ecological study of the cultivated field. It naturally follows that certain other parts of the subject receive rather less attention. Yet on the whole a fairly good balance is preserved in the space devoted to the various phases of the subject.

Among the features of the book deserving special commendation is the pleasing absence of teleological interpretations. The author is fortunate in finding no "beautiful adaptations" and in appreciating the fact that plants do not respond in order to "avoid dangers." There is also a pleasing absence of narrow or dogmatic statements so frequently found in text books of elementary science. The author shows himself familiar with the most recent investigations in this department of science and gives ample citations of literature to guide the independent student should a more detailed knowledge of any phase of the subject be sought. The character of its contents make it suitable for agricultural high schools and colleges as a student's text book and useful in ordinary schools as a book of reference. It is certainly a text that may be heartily recommended as the best available for teachers in high schools and colleges who are endeavoring to apply botanical instruction to the solution of agricultural problems.

Geo. D. Fuller.

The University of Chicago.

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